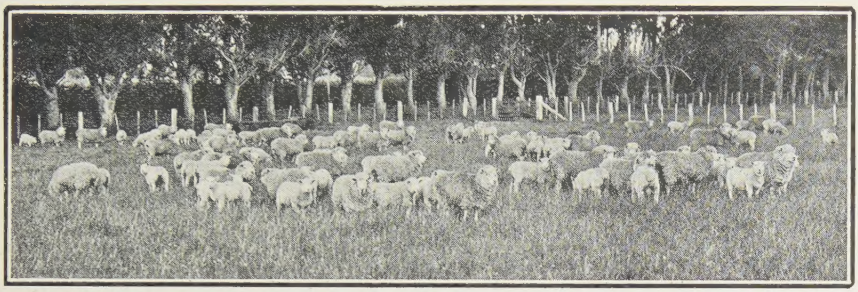

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THE GRASSLANDS OF NEW ZEALAND.

PRINCIPLES OF PASTURE-ESTABLISHMENT.

(Continued.)

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COASTAL SAND AREAS.

IMMEDIATELY behind the sea foreshore in many districts are areas of more or less raw sand presenting soils impossible to grass by the ordinary methods of pasture-establishment. It is not that such soil, as regards plant-food content, is incapable of supporting grass, but the physical and mechanical conditions of the soil make grass-establishment impracticable until the surface layers have become modified by the growing of some other preparatory vegetation. The conditions that prohibit grass-establishment from the offset may be briefly summarized as (1) coarseness of the soil-particles and their lack of cohesion ; (2) presence of a surface layer unretentive of soil-moisture ; (3) propensity of the soil-particles to be shifted easily by the wind ; (4) lack of humus ; and (5) absence of consolidation.

The fundamental principle underlying the upward movement of water in soils is that the particles be so placed together that the thinnest possible film of water may be maintained around each individual particle in a continuous system. The thinner the film is

around the particles the greater is its drawing-power from below; but just so soon as the particles become too widely spaced for a continuous film to be maintained around the soil-particles (Fig. 77, *b*) water ceases to flow from below and the soil becomes "dry." For this reason these sand soils are unretentive of soil-moisture at the surface, and, there being no cohesion between particles, the surface layer on becoming dry is easily shifted by the wind. Cohesion between solid particles, such as sand, is only possible in nature under extreme pressure or by the agency of some cementing substance. Sand-particles, however, may be held in a matrix of fibre, &c., such as is provided by humus (Fig. 77, *c*). Humus, therefore, will enmesh the solid sand-particles, hold

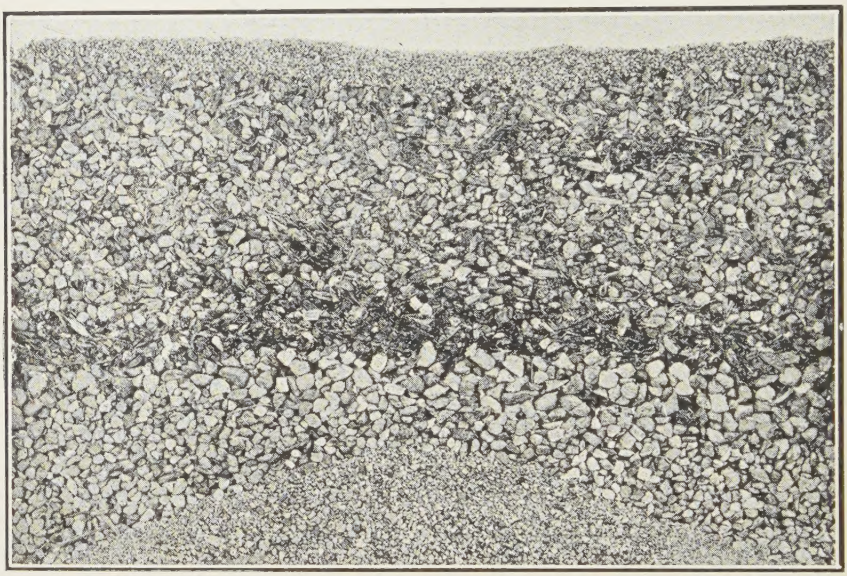

FIG. 77. SECTION OF SANDY SOIL.

Showing (*a*) fine sands; (*b*) a layer of coarse sand in which there is no humus (note the large interspaces and the lack of cohesion between the particles); (*c*) exactly the same-sized sand-grains as in (*b*) but mixed with humus (note how the humus fills up the angular interspaces and how it binds the particles together).

[*Photo by E. Bruce Levy.*

them together, and at the same time will fill up the angular interspaces with fibre substance, which not only offers within its tissues a reservoir for water, but makes possible under drier conditions the continuous thin water-film. Just so long as sands are wet—so great is the adhesive power of the water-film around the fine particles—an extremely consolidated soil results, firm enough, in fact, to afford an almost ideal racing-track for motor-cars. Despite this fact, in dealing with sand country one of the essentials is consolidation, so much so that ploughing must be reduced to a minimum until such time as the humus content is increased.

The principle of consolidation when applied to most soils—as in the case of peat swamps, for example—is to bring into close contact the soil-particles. With loose sand, however, the particles themselves naturally lie as close together as their angular nature will permit, and in the case of sand country consolidation must be viewed not so much as a compacting of particles but rather as a binding of particles to render their displacement more difficult. When we walk over dry loose sand the sand under our feet is not so much consolidated as it is displaced, and the principle of consolidation is to render more difficult this displacement of particles. Here, then, humus must come in to provide the binding-element.

With regard to the sand areas themselves, these may roughly be divided up into two classes: (1) the dune complex, immediately bordering the coast, and (2) stabilized sandhills and sand-plains, generally some distance removed from the coast. These types will be dealt with separately, and the present article concerns itself only with the first-named class.

1. THE DUNE COMPLEX.

The general topography of what is termed the dune complex is marked by more or less irregular hillocks of sand scantily covered by patchy shrubby growth, with the spaces between the hillocks gouged out, forming hollows, in some of which small lakes may appear (Fig. 78). Cockayne* has described the appearance of the dune complex as "a sea of sand, the ridges stationary billows, and the scanty vegetation showing only as small yellowish or dark patches on the general white or greyish background." Throughout the dune complex wandering dunes may occur (Fig. 79), which when large tend to level off the topography.

In the dune complex, then, are presented loose soils, soils irregularly disposed in hillocks and hollows, soils lacking in cohesion and in surface moisture, subject therefore to rapid drying and to displacement by the wind, and exposed also to the saline air from the sea. At first it may appear an impossible task to successfully grass these dune areas, and undoubtedly the process is one where the factor of time must play an important part. Certain very definite principles must be closely followed, else any attempt at grassing must end in ruin, not only to the immediate area but also to surrounding adjacent lands already in grass.

SAND-BINDING WORK AND PLANTS.

Work must be commenced at the seashore, or at that point which is the source of the sand-supply, and here it is useless to plant any but those plants especially designed by nature to tolerate an ever onpiling sand-cover. Sand-binding plants must be such structurally that rapid elongation of stem upward or forward is possible (Fig. 80), and that free root-formation may take place at intervals up or along such stems (Fig. 81). Also, the leaves must be tough to withstand the desiccating sea-winds, and so disposed that a more or less open sieve-like resistance is presented to the sand-bearing wind. Of the

* L. Cockayne, Report, *Dune Areas of New Zealand, their Geology, Botany, and Reclamation.* Government Printer, Wellington, 1911.

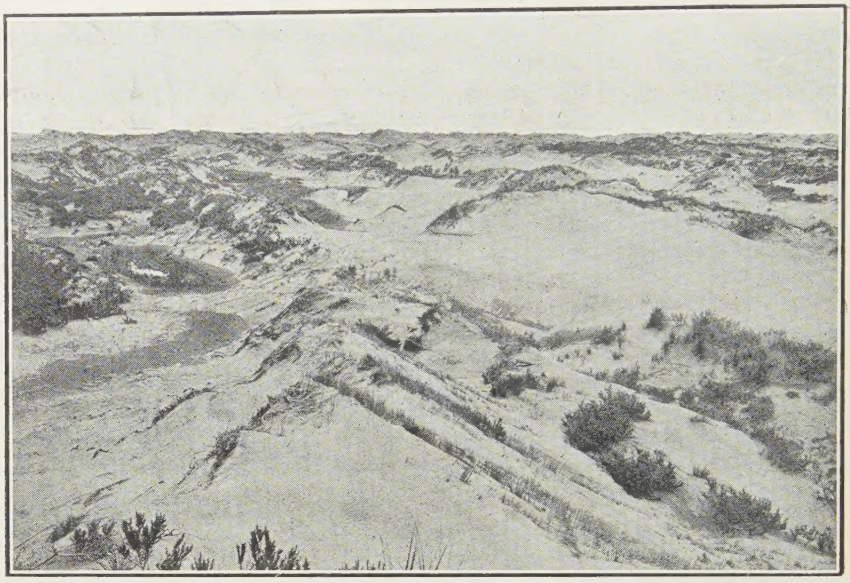

FIG. 78. THE DUNE COMPLEX.

"A sea of sand, the ridges stationary billows, and the scanty vegetation showing only as small yellowish or dark patches on the general white or greyish background."

FIG. 79. WANDERING DUNES WITHIN THE DUNE COMPLEX.

The foremost dune has been planted with marram; the back one is progressing forward, covering over a small sand-plain.

[*Photos by E. Bruce Levy.*

FIG. 80. PINGAO, SHOWING THE ESSENTIAL SAND-BINDING CHARACTER OF STEM-ELONGATION.

Note the plants arranged in a row-like manner, which is due to tillers from the stolon of this sedge rising above the onpiling sand.

FIG. 82. SILVERY SAND-GRASS (SPINIFEX HIRSUTUS).

[*Photos by E. Bruce Levy.*

plants of this nature available undoubtedly the most important are marram-grass (*Ammophila arenaria*), silvery sand-grass (*Spinifex hirsutus*) (Fig. 82), the pingao (*Scirpus frondosus*) (Fig. 80), and sand-fescue (*Festuca littoralis*). The sand-fescue is not so effective a sand-binder as is marram or pingao, and it cannot cope with a heavy sand-drift, but on fairly established fore-dunes it is quite a valuable grass. Such plants should form the cover of the foredune, and until such time as this foredune is formed (Fig. 83) no work in the rear of the foreground should be attempted. This principle holds right throughout the dune complex. Wherever there is moving sand the sand must be arrested by the planting of marram-grass, this grass being really the best to use when any planting is to be done. The planting should follow the moving sand from the source of the drift onwards. This arresting of the wind-borne sand is of very great importance. It is fraught with many intricacies of management, &c., that can be dealt with fully only in a special treatise, and wherever large areas are being dealt with the reader is specially referred to the standard New Zealand work on this subject by Cockayne previously quoted.

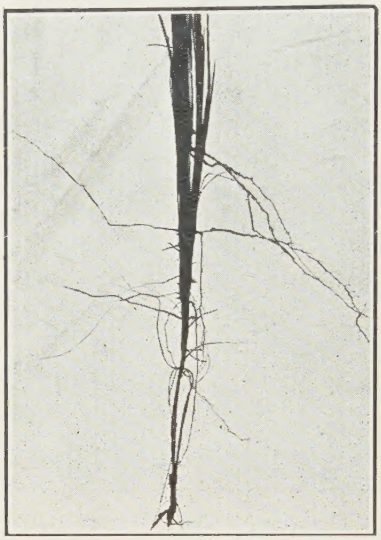

FIG. 81. SAND-FESCUE, SHOWING ESSENTIAL CHARACTER OF ADVENTITIOUS ROOT-FORMATION UP THE STEM AS THE SAND-LEVEL RISES ROUND IT.

[*Photo by E. Bruce Levy.*

THE HUMUS-SUPPLY AND TREE-LUPIN.

In the lee of the foredune there will be little if any movement of sand, and here is started the second phase of pasture-establishment. It has been already pointed out that one of the great essentials in sand-reclamation is to increase the humus-supply of the soil, so that consolidation and retention of moisture may be effected. Undoubtedly the pioneer plant in this connection is the tree-lupin (*Lupinus arboreus*) (Fig. 84). Plants may be put in or seed sown broadcast over the area, and if the sand has firmed somewhat a slight stirring of the surface will be necessary in order to get a cover for the seed. Generally, however, the surface is loose and inclined to shift a little when the wind is strong, when no stirring will be necessary preparatory to sowing. To effect establishment under these conditions branches of lupin bearing mature pods are best strewn over the ground, or the seed may be sown within its pods—that is, the pods are gathered and strewn broadcast over the area. It must be clearly borne in mind that this crop is only for the one purpose—namely, to increase the humus content of the soil. No stock will eat it, nor will the plant act in any way as a sand-binder; consequently, unless the foredune covering of marram, &c., is sufficiently effective to hold back the main blast of sand the lupin will be simply covered over, even if it has succeeded in establishing.

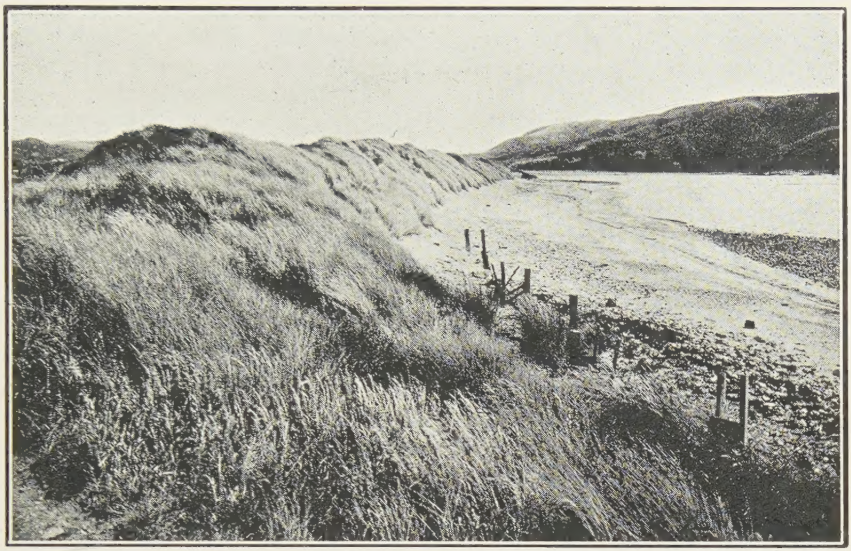

FIG. 83. THE FOREDUNE, WHICH ACTS AS THE CATCHMENT STRUCTURE FOR THE SAND BLOWN UP FROM THE SEASHORE.

Without the formation of the foredune no sand-reclamation work is possible.

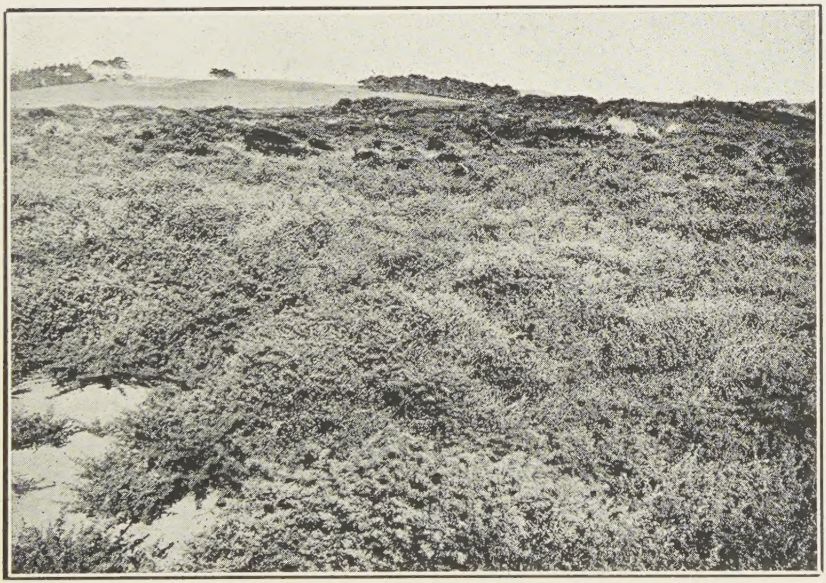

FIG. 84. THE SECOND PHASE OF SAND-RECLAMATION: TREE-LUPIN ESTABLISHED IN THE LEE OF THE FOREDUNE.

[*Photos by E. Bruce Levy.*

For three or four years the tree-lupin will flourish and will enrich the soil with humus and nitrates, but it is very important to recognize that it is not a permanent cover, and, generally speaking, after four or five years it begins to get stunted in growth and to die out. It is at this point that the third phase of pasture-establishment must begin. Within the shelter of the lupin, just so soon as there is the least appearance of thinning-out, other plants must be established.

Coastal sand country in New Zealand is practically always moist a few inches down from the surface, and the surface layer is dry only because of its poor capillarity. The lupin, by increasing the humus content and by its shade, makes possible capillary attraction almost right to the surface, and consequently the conditions within the lupin-covered sands are essentially moist. This is reflected by the plants that one actually finds growing within the lupin cover. Chickweed (*Stellaria media*), hedge-mustard (*Sisymbrium officinale*), prairie-grass, and Yorkshire fog may be cited—plants, indeed, which habitate for preference damp shady situations.

GRASS-ESTABLISHMENT.

In the shade and shelter of the lupin is thus afforded an extremely good opportunity for plant-establishment, and not only is such establishment possible but absolutely imperative if the good work commenced by the lupin is to be carried on. In many places in the North buffalo-grass (*Stenotaphrum glabrum*) has been planted with success (Fig. 85), and there is no doubt that this grass is quite capable of holding loose sand following on the lupin cover. If planting is to be done, however, and if the area is to be utilized for pastoral purposes, there seems to be little question that the plant to replace the lupin on all coastal sands of the North Island and of the warmer of the bays of the north-east and west coasts of the South Island is paspalum (*Paspalum dilatatum*) (Fig. 86). On the eastern and southern dunes of the South Island in general paspalum would be useless owing to the coldness of the winter, but for all the coastal sands where the winter temperature does not kill out this grass there is no plant available better fitted for the work in question. It must be remembered that in exposed sand-area pastures, even when fixed sands are being dealt with, the limiting factor to growth is the lack of moisture in the surface layers during the summer. Trees of almost all descriptions usually do well on sand areas, for one reason because their roots penetrate deeply into the loose subsoil where the moisture is present. Paspalum has a root-system capable of extending downwards fully 10 ft., and this fact accounts for the extremely luxuriant growth of this grass in dry summer weather when other grasses are parched up.

If the planting of paspalum within the lupin is too great an undertaking seed may be sown, but other quicker-establishing plants will be necessary to function while the paspalum is establishing. Even if paspalum-plants are put in, a sowing of some additional grasses and clovers should be made also along with the planting. Of plants other than buffalo-grass and paspalum likely to be successful when sown within the lupin the following are outstanding: Yorkshire fog, sweet vernal, Poa pratensis, Waipu brown-top, and prairie-grass among the

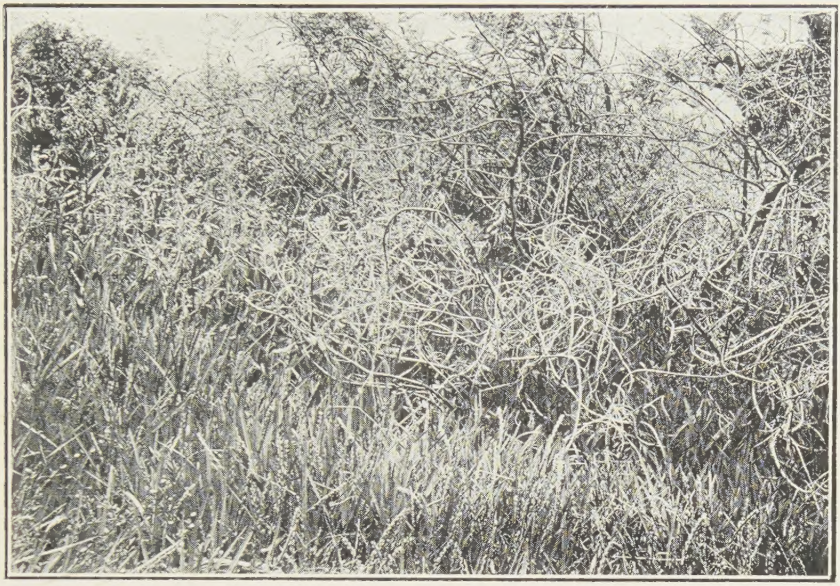

FIG. 85. REPLACEMENT OF THE LUPIN COVER BY BUFFALO-GRASS.

Note how the lupin is dying out and the fine growth the buffalo-grass is making.

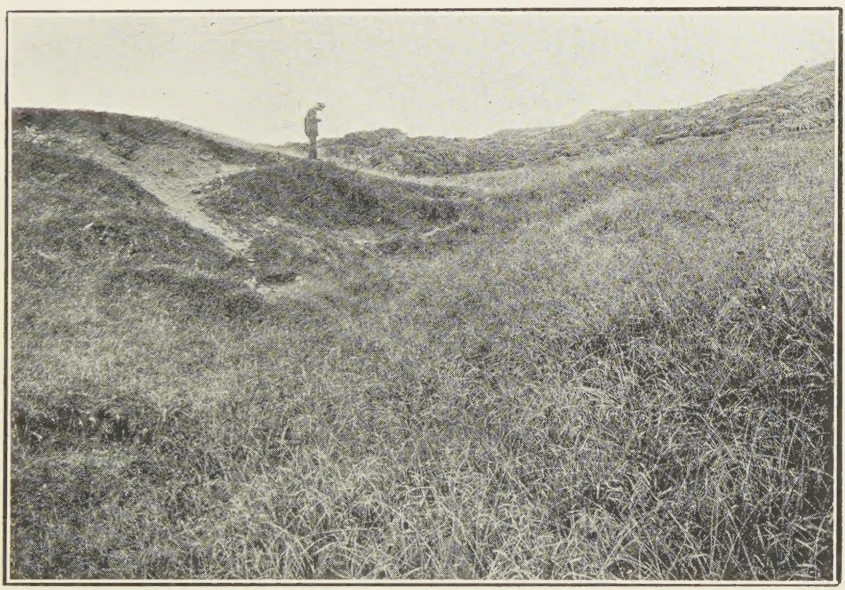

FIG. 86. PASPALUM SUCCESSFULLY ESTABLISHED ON ALMOST RAW SAND.

Such a sward is produced by paspalum that stocking could be carried on without any fear of a sand-break. To the left in photo, where ratstail, hair-grass, danthonia, &c., form the main cover, a bad break in the sand has occurred. [*Photos by E. Bruce Levy.*

grasses, and Lotus hispidus, English trefoil, King Island melilot, and Bokhara clover among the clovers. Any of these grasses and clovers will establish well on sand country within the lupin shelter. King Island melilot and Bokhara clover are not very palatable to stock, but are good humus-formers, and their presence on loose sand country is extremely important in case the area should be accidentally fired. Particularly is this true of King Island melilot. This plant is an annual, but seeds very freely, and the seeds are capable of remaining viable in the soil for many years. Provided a dense cover of perennial grasses and clovers is maintained on sand country very little King Island melilot makes its appearance, but should the area be burned, or breaks otherwise occur in the turf, the melilot germinates almost immediately, and rapidly covers over the area with a green sward long before the grasses and clovers of the original cover have recovered from the burning (Fig. 87). On no consideration, however, should sand areas be purposely burned.

As to the mixture to sow among the lupins it is difficult to give a definite one, but the following proportions are suggested: 4 lb. Yorkshire fog, 6 lb. perennial rye-grass, 2 lb. Poa pratensis, 1 lb. Waipu brown-top, 4 lb. paspalum, 2 lb. sweet vernal, 2 lb. King Island melilot, 2 lb. Lotus hispidus, 2 lb. English trefoil; total, 25 lb. per acre. If prairie-grass seed can be readily procured some of this could be included, but it makes the mixture very expensive if it has to be purchased, and prairie-grass will remain as a constituent only while sheltered by the lupin cover.

STOCKING OF AREAS.

The fourth phase in pasture-establishment is the stocking of these areas after the grass is well established within the lupin. On no consideration should the lupin cover be cut down. It should be left to be tramped and broken down by stock, and as more and more lupin clumps are thus opened up more and more planting or sowing of seed should be carried out. If, however, there is any tendency for breaks of bare sand to appear by the stocking, the stock should be at once removed. Unless paspalum or buffalo-grass is used this is almost sure to happen. This breaking-up of the turf and exposure of the loose sand is one of the things that must be at all costs watched and guarded against, for a small break may soon mean the ruination of the whole area. Immediately a break does occur marram-grass or lupin should be planted on it, or, if the time is unseasonable for such planting, pieces of scrub such as gorse or manuka should be cut and laid over the exposed sandy surface until rain falls and planting may be done. In all cases the foredune should be well protected from stock, and particularly is this true if spinifex is the main plant of the foredune, as stock eat this grass quite readily.

CONSOLIDATION AND NURSE-PLANTS.

With regard to those areas within the dune complex (apart from the foredune) which have on them shifting sand (Fig. 79), the practice for arresting the sand may be modified to some extent. Marram-grass will have to be planted from the source of the drift to its termination; but as this planting is for the one purpose of fixing the sand already on the area, and not to act as a permanent catchment

FIG. 87. REPLACEMENT OF MARRAM-GRASS BY KING ISLAND MELILOT, ETC.

This area has been recently burned. Before the fire the association consisted of Yorkshire fog, marram, English trefoil, tall oat-grass, and cocksfoot, but scarcely a trace of King Island melilot. In the photo no English trefoil has yet established, and the growth shown is in the main King Island melilot.

FIG. 88. THE ICE-PLANT AS A NURSE-BED.

The ice-plant is here seen invading a raw sand area, and functioning as a nurse-bed for the establishment of other non-sand-binding plants. Sowthistle, Yorkshire fog, perennial rye-grass, and King Island melilot may be noted. The dark growth to the left is King Island melilot.

[*Photos by E. Bruce Levy.*

structure as is the foredune, other plants may also be planted to advantage—plants that will readily grow in quite raw sand but yet be of greater service than marram in consolidation of the surface and in increasing the humus, and that will therefore act as a good forerunner for the later establishment of non-sand-fixing plants like paspalum and others already mentioned. The most valuable plant in this connection is undoubtedly the large ice-plant (*Mesembryanthemum edule*), and if this be planted between the marram-plants a dense cover will soon be formed. This growth will continue until the sand becomes quite consolidated, and when this has happened the ice-plant no longer thrives so luxuriantly. Small openings will appear where it has begun to die out, and these will provide excellent opportunity for grass and clover establishment (Fig. 88). Thus one type of plant-growth will have paved the way for the successful establishment of another entirely different type of plant.

This method of securing a seed-bed or a nurse-bed for pasture plants has widespread application in nature, and really is one of the basic principles upon which depends the formation of the various plant associations that comprise a natural vegetation. The forests or other natural plant associations met with in New Zealand are the outcome of a great series of changes, the one plant-form by its very growth creating a habitat often different from that which it occupied in the first place, and to which it must have been attuned or else it never would have become established. By its growth, however, it modifies that environment, creating new sets of conditions which may be favourable to the establishment of more vigorous forms; it may even have created conditions unsuitable for its own propagation, and consequently it goes out, being displaced by forms adapted to those now altered conditions. Thus marram-grass or the sand-binders as a whole as soon as the sand is fixed and the sand-supply thus cut off become degenerate and die out. In other words, they have by their growth created a new set of conditions unfavourable for their own perpetuation but favourable for the establishment of plants of a somewhat different growth-form. The manuka, mingimingi, *Pomaderris*, and *Dracophyllum* association of the coastal sands of North Auckland does not comprise the plants nature used in the first place to cover those sand areas. This association has replaced such plants as the toetoe, dune-coprosma, tauhinu, pimelea, and other actual sand-loving plants, which themselves had replaced the true sand-binding plants, spinifex, pingao, sand-sedge, &c. Nature's methods may be slow, but they furnish an excellent guide as to those methods likely to be successful in the hands of the farmer, and, what is more, it is of the utmost importance to heed the advice that nature gives.

GENERAL.

The writer may perhaps be somewhat optimistic in his view that the raw sand areas of the dune complex may be effectively grassed along the lines here indicated, but whether or not grassland may be established some form of plant-cover should be secured, as these sands are always a menace to neighbouring lands which at the present moment may be in grass or be potential grassland, or under cultivation (Fig. 89).

In the foregoing matter no attempt has been made to deal with any specific sand areas, the object being to outline generally the methods that must be adopted for most coastal sands. Special areas, according to the nature and extent of the sand and according to climate, will demand some modification of the scheme outlined. Large wandering sand-dunes, owing to their extreme aridity and rapid sand-movement, as well as their enormous size, are quite beyond individual effort, and must become a matter for the State or local bodies. Certain larger or smaller sand-plains within the dune complex already carry a fair amount of vegetation, and here grass-establishment may be possible without any previous lupin cover. Generally speaking, such sand-plains would be the first to be tackled by any one settling on sand areas, as undoubtedly they could be made

FIG. 89. WANDERING DUNE BURYING AGRICULTURAL LAND.

The forest seen consists of pohutukawa and some kauri. The dead limbs showing in the foreground are the top of a great pohutukawa, 60 ft. to 80 ft. high. [*Photo by E. Bruce Levy.*

to produce at the least cost in time and money. Where large sand areas have to be planted in marram the possibilities of this being done by individual farmers are remote, but where only comparatively small areas occur the operations here described could well be applied by them.

Afforestation can also be carried out on coastal sands, and on many dune areas the establishment of forest is the final goal. The remarks made here regarding the early stabilizing of the sand apply to the establishment of forest-trees as well as to grass, the difference being that, instead of sowing or planting grass, trees will be planted or their seeds sown among the lupins or on the beds formed by the ice-plant.

(To be continued.)

TURNIP AND RAPE-SEED PRODUCTION.

SUCCESSFUL WORK IN CANTERBURY.

F. E. WARD, Instructor in Agriculture, Christchurch.

FOR some three years Mr. Norman Campbell, of Woodbury, Geraldine, has been experimenting in the production of turnip, swede, and rape seed on the Continental system. That he has succeeded is shown by the fact that in the years 1920 and 1921 he sold enough seed to sow 100,000 acres, and his seed is used extensively in his own neighbourhood. Tests carried out by the Department of Agriculture have proved very satisfactory.

The outstanding virtue of locally grown seed is that it can be put on the market quite fresh. It therefore has greater vitality than imported seed, and though the laboratory germination test may not show a marked superiority the actual result in the soil is considerably in favour of the local product. Owing to its freshness and vitality it gets a much better start. The fact that it is acclimatized is also a factor in its favour. It is claimed by Mr. Campbell and by turnip-growers in his district that a crop grown from his seed is usually as far advanced in five weeks as other crops are at seven. This quick start is a great help under adverse weather conditions, also for the evasion of attack by fly, for when the whole crop comes away at once these pests have not the same chance as when the germination extends over a period. It has been proved also that a lighter seeding is required when locally grown seed is used, a reduction of 25 per cent. giving the most satisfactory results.

The method of production employed by Mr. Campbell will now be briefly described. The soil in which the seed crops are grown is of a medium clay-loam formation. The land is ploughed in the winter or early spring, a clean lea always being used. It is then cultivated and thoroughly cleaned during the summer. A small quantity of Sutton's seed is sown in October or November to test the purity of the sample. If it is found that the seed contains too many foreign elements it is discarded and other seed used. If satisfactory the seed is drilled early in March at the rate of 4 lb. of turnip, 3½ lb. of swede, and 6 lb. of rape per acre respectively. This thick seeding prevents bulb-development. Manure at the rate of 1¾ cwt. of superphosphate per acre is applied with the seed. No intercultivation is given. The plants remain dormant during the winter, but in the spring come away and begin to throw up the flower-stalk. The crop is then rogued for impurities. In the case of turnips the bulb grows about the size of an egg. With swedes the raising of good seed is more difficult, it being a hybrid plant, and the bulb must be allowed to grow larger in order to give character to the stem. If anything goes wrong the seed will revert to the stronger parent type. The crops are in full flower in October, and are harvested with the binder about Christmas. The seed is threshed out of stook and then mill-cleaned.

Great care is taken to prevent cross-fertilization. In the case of turnips, when more than one variety is grown the same season, the crops

are never less than one mile apart. A swede crop is never grown less than one mile from a turnip crop, and rape never less than two miles from a turnip crop. Never more than three varieties are grown at any one time. These precautions reduce the risk of cross-fertilization to a minimum. The whole of the work is carried out under the direct supervision of Mr. Campbell, and nothing is left to chance.

The varieties grown are Imperial Green Globe, Hardy Green Globe, and Red Paragon turnips, Garton's Superlative, Champion, and Crimson King swedes, and broadleafed Essex rape. The yields of seed per acre have averaged 400 lb. for turnips, 300 lb. for swedes, and 600 lb. for rape.

The cost of production per acre is given in the following items, the land being valued at £20 per acre, and the crop taking two years to produce: Rent, £2; ploughing once, 10s. 6d.; cultivating three times, 10s.; harrowing three times, 4s. 6d.; drilling once, 2s. 6d.; seed, 4 lb. at 4s. per pound, 16s.; fertilizers, 1¾ cwt. at £7 5s. per ton, 12s. 9d.; binder and twine, 12s.; threshing, £2 2s.; cleaning, 8s. 4d.; overhead expenses, £2: total, £9 18s. 7d. With a yield of 400 lb. per acre at 1s. 3d. per pound = £25, a credit balance is shown of £15 1s. 5d. per acre = £7 10s. 8½d. per annum.

SPAYING OF COWS.

THE following information is supplied by the Live-stock Division:—

The ovary may be removed from a cow through an incision in the flank or through an incision in the vagina. For the farmer the first is the simpler method, and it has the advantage of not requiring any very special instruments.

FLANK OPERATION.

This may be accomplished while the animal is standing. It is preferably done in a special race leading from an ordinary yard. The end of the race should be constructed in the form of a strong cow-bail, so that the animal's head may be secured. The left side of the race, next the bail end, should be formed by a gate about 6 ft. long, hinged to the head-post, so as to open outwards, and permit of freedom to the operator. The cow having been securely bailed up should be secured further by passing a strong rope round the body and fixing it to the right wall of the race, and also by tying the hind limbs, so that she cannot kick.

Before operating, the left flank should be thoroughly washed with a strong disinfectant, prior to which it is preferable, especially if the hair be long, to clip that region. Then a vertical incision should be made through the skin of the flank, just above the middle of the upper part; if the incision is made too far down there is a danger of severing an important artery which is situated there. The incision should be about 4 in. long, just sufficient to allow of the entrance of the hand, and should be made with one sweep of the knife. The underlying muscular tissue should not be cut through, but the fibres should be separated by means of the fingers (after thoroughly washing the hand and arm and treating with an antiseptic wash) sufficiently to allow

the passage of the hand. In like manner the peritoneum, or lining membrane of the abdomen or belly, should be pierced by the fingers; then the hand and arm should be introduced into the abdominal cavity, and turning the hand backwards the horns of the womb should be felt for. Each of these should be followed up to its termination near the backbone, where the ovary will be found as an oval body of about the size of a walnut or larger. Each ovary should be drawn gently between the fingers and thumb to the wound, where it should be removed by twisting, using the knife as little as possible, to prevent bleeding. On completion of the operation the edges of the muscle-wound will naturally approximate without sutures. Through the skin should be placed one or two stitches, using a packing-needle and strong thread, or thin soft twine, all of which should be previously sterilized by boiling and kept till required in a 2-per-cent. solution of lysol or carbolic acid. After suturing the wound it should be covered with an application of Stockholm tar, in order to prevent irritation by flies and the entrance of dirt. Provided the operation has been carefully performed, and with reasonable antiseptic precautions, no subsequent bad effects need be apprehended.

OPERATION BY THE VAGINA.

This is more difficult, and should rarely be attempted by the farmer. It consists of opening into the abdominal cavity through the roof of the vagina or passage leading to the womb. The cow should be secured in such a manner as to allow the operator to work comfortably and freely standing behind the animal. The vagina should be washed out with an ordinary antiseptic solution, using a tube or funnel, or a syringe in the same way as a cow is irrigated for abortion. The exterior of the vagina and surrounding region should also be thoroughly cleaned to prevent contamination of the wound. Then, into the vagina should be inserted a speculum, a special instrument for distending the passage and facilitating the work. An incision should now be made into the upper wall of the passage, about 2 in. back from the mouth of the womb, which may be found projecting into the vagina. The incision should be made with a guarded knife, cutting from before backwards, and it should not exceed 3 in. in length. Some operators make a smaller incision and enlarge the aperture with the fingers in order to prevent bleeding as much as possible. Through this opening the hand should be introduced, and passing over the back of the uterus up the horns each ovary may be found, and drawn down carefully into the vagina through the incision. Generally, a fold of the broad ligament in which the ovaries lie is brought down with them. This should be divided with the long scissors specially made for the purpose; then special torsion forceps are introduced and the ovary grasped, after which the left hand is used to hold the end of the ligament, and the forceps, manipulated with the right, to remove the ovary by torsion. It is not necessary to suture after this operation.

GENERAL PRECAUTIONS.

The cow or heifer to be operated upon should be in fair condition, not too fat nor too lean. She should neither be in heat nor be pregnant. If in full milk it is preferable to starve her for eighteen hours or so beforehand. Care should be taken not to mistake, as has occurred,

the adrenal body, which lies in front of the kidney, for the ovary, which lies behind that organ. Besides this error the beginner is apt to mistake a lymphatic gland or open a loop of intestine for the ovary, before experience teaches him exactly where to find that body and to know almost instinctively whether he has secured it or not. Antiseptic precautions should always be adopted. As to complications resulting from the operation, the most common are blood-poisoning and hæmorrhage. Abscesses, peritonitis, and lockjaw have often been known to occur, however. Transmission of tuberculosis from affected cows directly to several others has also occurred, as proved by the diseased condition of the wound after slaughter. On the other hand, heifers, and even dry cows, have been known to be spayed and then forthwith dehorned without any appreciable ill effects resulting. Regarding after-treatment, under ordinary conditions prevalent in New Zealand nothing is required beyond good pasturage and quiet.

FIREBLIGHT.

(Concluded from June Issue.)

R. WATERS, Biological Laboratory, Wellington.

LONG-DISTANCE TRANSMISSION OF THE DISEASE.

By Birds and Insects.

THE writer's experiments indicated that the fireblight bacteria were able to survive for some days in thin dry films of water-diluted ooze. The effects of desiccation in this manner began to show themselves upon the bacteria in eight days, and on the ninth day there was no sign of life at all. These experiments were made in the dark, and at the optimum temperature for the organism. Direct sunlight appears to be much more destructive than desiccation pure and simple; it has been shown that the organisms commence to expire in less than an hour in the direct rays of the sun—a feature of very great importance. *Bacillus amylovorus* is not well adapted to withstand exposure to conditions such as these. It has never been observed to produce spores. Nevertheless, there are remote possibilities of the transference of the disease by insects or birds internally or externally over very long distances. Even if their naturally long flights were insufficient, favourable winds of high velocity might complete the work. Granted that the organism has been successfully carried for thirty or forty miles alive, its vitality nevertheless might be so low as to render infection impossible. On many occasions unfavourable conditions have been observed to deprive the organism of its power to infect. Cultures held on artificial media for a few weeks have often lost their pathogenicity. Seeing, therefore, that desiccation and sunlight are in such a short time lethal, it is fair to assume that they likewise result in a gradual lowering of vitality before death sets in—in fact, such is actually indicated in the desiccation experiments. Further, in order to establish the disease not only would the organism require to be carried alive and in a requisite state of vigour, but such transference would have to

be made at a time when conditions were ripe for inoculations. For instance, flowers, young shoots, or wounds on plants susceptible to the disease must be available and suitable conditions of temperature and moisture prevail, otherwise destructive agencies such as sunlight might destroy the organism before it was able to infect.

In laboratory experiments it was found that the infection of flowers was best accomplished at a temperature of about 25° C. (77° F.), and especially when a drop of water was inserted into each flower after inoculation. It would appear that a number of artificial inoculations

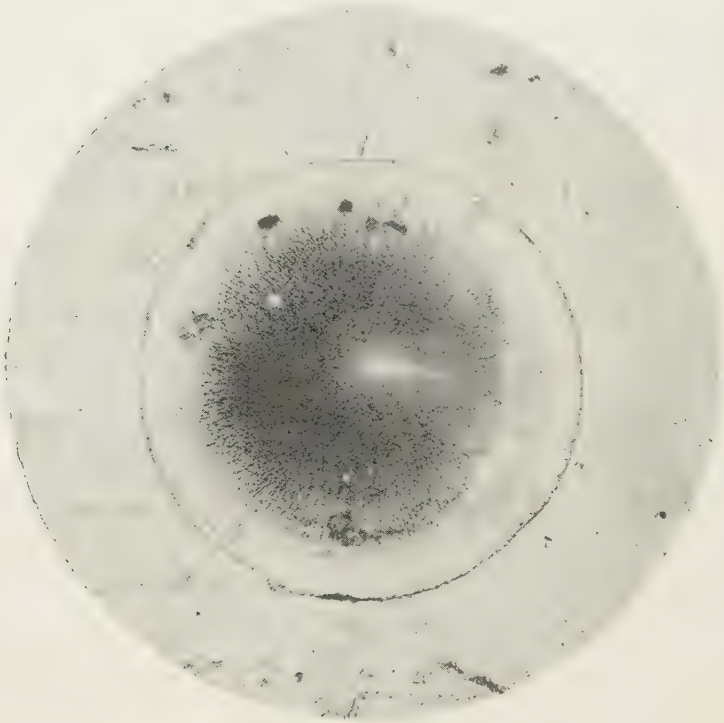

FIG. 9. COLONY OF BACILLUS AMYLOVORUS GROWN ON BEEF-PEPTONE-AGAR MEDIUM.

Numerous fine wavy lines are seen radiating from the centre outward toward the periphery. Magnified 15 diameters.

[*Photo by E. Bruce Levy.*

failed for lack of moisture. Over and above all this there is certainly some good reason to believe that the strains of *Bacillus amylovorus* as they occur in the field are not all equally pathogenic. The greatest successes in artificial inoculation have been obtained with strains of the bacillus which when grown on beef-peptone agar show radiate colony characters (Fig. 9). After some four weeks on this medium this radiate character gradually gives place to a uniformly granular appearance. Such "granular" cultures have not established the same ready

infection on inoculation. The point of interest is that these weaker "granular" strains can be collected direct from the field. It is, further, a matter of great importance to know that the American culture supplied by Dr. G. L. Clapp, of Cornell University, New York, for the purposes of comparison clearly showed the radiate colony characters on its first sub-culture in New Zealand. This strain had been used successfully for some time in New York for experimental inoculation work. All this goes to show that there are important factors at work which tend more or less to restrain the transference, the multiplication, and the pathogenicity of the organism. Therefore if on occasions the bacterium was transported for considerable distances the probability is that in a good proportion of such cases it would for various reasons fail to set up disease.

By Man.

On the other hand, the writer has shown that the bacteria can live for nine months in undiluted ooze; further, that they can live for two months in pure water without entirely losing their radiate colony character or their power to infect. It has also been seen that the organism can winter over in the bark of fruit-trees and hawthorn. There is no conceivable manner by which fireblight could enter New Zealand from America or Japan except through the agency of man himself. Only total prohibition of the importation of all susceptible hosts from infected places (if it could be effectually carried out) would prevent reintroduction of the disease; inspection of importations from such places would be but a partial safeguard. Similarly, there is no more likely means by which the disease may be carried over long distances within New Zealand than by man himself. If, then, the disease leaps some of our natural boundaries where no host plants grow, or if it passes across Cook Strait, it is highly probable that man himself will be to blame, and in the distribution of fireblight man is but little more controllable than the insects or the birds. It is impracticable to prevent a man transmitting by post or carrying infected material if he should be thoughtless enough to do so.

The publicity that has been given to the danger of transferring infected material from one place to another, and the regulations making it a punishable offence to send or receive susceptible plants from places where the disease is declared, will no doubt have a deterrent effect upon the spread of fireblight. It is a vital matter to our fruitgrowing industry, and every one should regard it as a personal duty to see that such regulations are not contravened.

NATURAL BOUNDARIES.

So far only the transference of the disease over long distances has been discussed, and this is of primary importance. The disease will not be got rid of in infected areas rapidly, if ever, and in the meantime every precaution should be taken to ensure, firstly, that it does not cross Cook Strait—our best natural boundary—and, secondly, that it is confined within the appointed boundaries to infected areas. Legislation and the co-operation of the people may prevent its passage to the South Island, but legislation alone could never do it. Practical work in confining the disease commences on the boundaries of infected districts.

Natural boundaries to fireblight on land consist of country where there are few if any plants in which the disease can become established. If an infected area is separated from an uninfected orchard district by a five-mile-wide belt of land where no host plants grow, then the usual flights of contaminated insects are rarely liable to carry the organism over such boundary. Fortunately, the boundaries are naturally much wider than this in many places. The extensive fruitgrowing areas of Hawke's Bay are protected by natural boundaries, as also are certain of the less extensive orcharding localities of the Wellington Province. Even if only a few host plants were allowed to persist on such boundaries they might act as stepping-stones for the disease. In order to prevent extension of the disease to uninfected portions of the North Island it is essential that appointed boundaries should be free from host plants, and that a sharp lookout should be kept on the uninfected side for any appearance of the disease should it chance to get across. Such inspection cannot be performed by one or two or, indeed, by many Orchard Inspectors. To check the disease it is necessary that every owner of susceptible trees should report all doubtful symptoms to the Orchard Instructor for his district. This most certainly cannot be relied on. Fruit-trees are to be found in such neglected condition that further injury from fireblight would attract no attention to them, and there are many owners that have neither the time nor the inclination to observe whether their trees are infected or not. Never before in the history of New Zealand fruitgrowing has the danger of neglected fruit-trees and of hawthorn been so clearly demonstrated as in connection with the occurrence of fireblight.

TREATMENT WITHIN INFECTED AREAS.

Reviewing the life-history of the fireblight organism and the development of the disease as described, it will be seen that insects are primarily responsible for the transference of the disease from tree to tree. They infect the flowers while performing a service for the orchardist—namely, in effecting pollination. It would be neither possible nor desirable to destroy such insects or to prevent them visiting the flowers. The object must be to prevent the insects from becoming contaminated with ooze, and if ooze is to be stopped all infected parts of plants must be removed and destroyed. This is the usual treatment for fireblight, and in infected districts of North America men are regularly detailed to inspect each tree and cut out all diseased parts. Such work, we are assured by American authorities, meets with success and is quite a payable proposition. But they particularly stress the necessity for thoroughness, and cases have been mentioned where a few cankers that had been overlooked brought disastrous results to the orchardists.

Orchard Inspectors appointed under our Orchard and Garden Diseases Act have power to require the treatment of any trees, and their destruction if such treatment is not adequately performed. When, however, the great extent of hawthorn hedges—stretching as they do from one end to the other of the Auckland Province—is realized, it is very apparent that the treatment of commercial or domestic orchards will to a large extent be nullified, and the extension of the disease to fresh localities facilitated, so long as the hawthorn is uncontrolled.

For many years publicity has been freely given throughout New Zealand to the demerits of hawthorn so far as fruitgrowing is concerned. Before fireblight appeared it was fairly common knowledge that mussel scale (*Lepidosaphes ulmi*), pear-slug (*Eriocampoides limacina*), and powdery mildew (*Podosphaeria oxyacanthe*) were aided by hawthorn. To these fireblight has since been added. One might truthfully dwell at great length upon the dangers of hawthorn to orcharding; one might further attempt to show that it is not only a menace to fruitgrowing but is actually of no service to mankind at all. During the last three years the real as well as the unreal vices of hawthorn have been proclaimed, but with little profit. Thousands would tear it out of the ground, but there are other thousands who would prefer that their fences were not interfered with. Thus one is forced into the following position: On the one hand, hawthorn is a weed—*i.e.*, a plant not desired by men in the position that it occupies; on the other hand, it is a valuable shelter-plant. Having regard to the value of hawthorn to dairy-farmers and others over certain areas, and equally regarding the menace it is in certain parts to orchardists, a Fireblight Act has been passed during the current session of Parliament, defining orchard areas and giving the Government authority to declare the course of procedure to be adopted with regard to hawthorn according to the individual needs of each locality.

CONTROL.

(Horticulture Division.)

From the detailed descriptions given in the foregoing article of the disease known as fireblight it will be readily understood that control measures to be of value must be very thorough, and also very complete; in fact, one well-placed hold-over canker (an occurrence which may follow the careless cutting-out of diseased parts or the lack of vigilance on the part of the person having this work in hand) not only may nullify the whole of the control work done, but is extremely likely to do so, or at least to reduce its effectiveness very materially.

The only satisfactory method of control to adopt lies along the line of complete removal of all diseased portions of the affected tree. It is therefore essential to carry out a very careful search for the purpose of locating every single infection in the locality, whatever the host plant may be, and, when located, such infected parts should be thoroughly and completely cut out and destroyed by burning. As each new season's outbreak of fireblight is due to the ooze which arises from hold-over cankers being carried by insects or other agencies to the blossoms of suitable host plants, the cutting-out of infections should be completed well before the blossoming-period.

All infected shoots, laterals, &c., should be cut back into undoubtedly healthy wood. In the case of the complete removal of moderate-sized and larger branches—a practice which has frequently to be adopted owing to the rapid development of the disease, particularly in the early summer—the final cut should be made at least 1 ft. below the apparent infection. However, under circumstances less favourable to the disease the larger limbs of the

tree may be saved by operating on the diseased area alone. This operation may be performed as follows: Take a sharp knife and make a more or less circular cut around the margin of the canker, but keeping well back into the healthy bark. Then remove the whole of the diseased and healthy bark that lies within the marginal cut, scrape the wood clean, and thoroughly disinfect the wound by swabbing with a 5-per-cent. solution of formalin or lysol, or (possibly better still) the disinfectant now popularly used in America for this purpose—equal parts of cyanide of mercury and bichloride of mercury to 1,000 parts of water. After sterilizing the wound should be painted with a mixture of creosote and tar or white-lead paint, preferably the former. Every care should be taken to prevent the inadvertent spread of the disease by the careless use of affected tools, &c. All knives, saws, or other implements that could possibly come in contact with the disease should be thoroughly sterilized by immersion in one or another of the above-mentioned disinfectants before being put to further use.

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The Victorian Milk-record.—The Victoria Department of Agriculture has kindly supplied the following official details of the recent performance of the Weraroa-bred Friesian cow Dominion Segis Fobes, a note regarding which was published in the August *Journal* (p. 128): Calved, 18/8/21; days in test, 273; milk, 18,895 lb.; average test, 3·26; butterfat, 615·81 lb.; milk last day, 57½ lb.; recalved, 10/9/22.

Correction.—In the answer to an inquiry printed on p. 124 of the August *Journal* certain superphosphate was stated as grading 42–44 per cent. P_2O_5. This was an inadvertency for $Ca_3 (PO_4)_2$ (tricalcic phosphate). The correction applies to lines 9 and 11.

WORKING OF BUTTER IN THE DAIRY FACTORY.

W. DEMPSTER, Dairy Instructor, Hamilton.

THE three objects to be aimed at in working butter are the incorporation of the desired percentage of moisture, the desired percentage of salt, and getting the desired body. A number of our buttermakers are making the latter two objects subservient to the former, with the result that a considerable amount of butter is arriving at the grading-stores either over- or under-worked, also showing a great lack of uniformity in salt-content. The three objects, being part of one operation, are easy of attainment in the hands of a skilful buttermaker.

The first thing necessary is to make sure that each churn will drain dry. This can be tried by putting some water in when the churn is empty. If the cocks will not allow it to drain thoroughly, a $1\frac{1}{2}$ in. hole should be bored at the lowest point, and a wooden plug fitted. By churning until the granules are about the size of maize-grains it is easy to drain the churn until 16 per cent. or less of moisture is left in the churning. 1 lb. of salt will dissolve in $2\frac{3}{4}$ lb. of water, so that it is not necessary to dissolve salt before adding it to the churn. Doing so only makes more brine, which must be afterwards run down the gutter. The writer recently drew the attention of one maker who was dissolving the salt to the fact that, in a churn which contained 10 cwt. of butter, he had run away 146 lb. of brine, while the total weight of water incorporated in the whole churning was 169 lb., so that well over 40 per cent. of the salt and preservative was lost.

After the churn is drained the operator should add the salt, put the door on again, and then run the churn on high gear until all the salt is dissolved. Care should be taken not to start working until the salt is dissolved. The butter should now be worked until it begins to take in moisture. This is the point where the judgment of the operator is required more than at any other stage. Counting the revolutions, or putting the churn in motion for so many minutes, is merely a guide. The temperature of the butter and the wash-water, and the speed of the churn, retard or accelerate the operation. It is only the judgment of the buttermaker which counts. The senses of sight and touch become so developed that the efficient operator knows instantly when the desired point is reached, and can invariably run to between 14 and 15 per cent. of moisture.

The churn should now be drained again into a shallow vessel (the lid of a 20-gallon can is suitable). While the churn is draining the operator should be making his first moisture test. Should the test show 14·2 per cent. it is necessary to add 0·3 to 0·5 to this test, to allow for moisture which will not drain. This varies according to the size of the churning, the latter figure being applicable when the churning is small. The operator soon gets to know what allowance to make for each individual churning, but for a 1,200 lb. Topliss churn when full 0·3 will be a fair average to add to first test. If the desired amount of moisture is 15·5 per cent., then deduct 14·2 plus 0·3 from this amount, which leaves 1 lb. of moisture to be added to the churn for every 100 lb. of butter. As an extra precaution the churn should be

given another turn to ensure it being properly drained, as sometimes a piece of butter may be blocking the cock.

For a churn containing 1,200 lb. of butter 12 lb. of the brine caught should now be added. If sufficient brine has not been caught it will be necessary to add water to make up the desired amount. The writer knows of an instance where, after doing sixteen churnings, only 41 lb. of brine was lost—an average of $2\frac{1}{2}$ lb. of brine per churning—so that practically all the salt and preservative used had been incorporated in the butter. Before adding the brine the cocks are shut, and the butter is then worked until the moisture disappears. It will be generally found that the moisture is absorbed before the butter reaches the desired texture. Should the butter be overworked before the moisture is absorbed, it indicates that there has been too much working before draining, or, in other words, the butter has been worked when there was not sufficient moisture for it to absorb. Where a churn is inclined to make the butter salvy it will be found advantageous to dump the butter well before putting in the worker.

By draining the churn, testing the moisture, and weighing in the desired amount of brine it is not possible to get a churning with over-moisture, as more moisture cannot be incorporated than the churn contains. It is desirable to work so that as near 1 per cent. as possible remains to be added after first testing, so that a miscalculation of 100 lb. of butter either over or under the estimate will only make the final test either 0·1 over or under the percentage aimed at.

INTRODUCTION OF VACCINES AND SERUMS: A WARNING.

It may not be generally known that section 20 of the Stock Act prohibits the introduction into New Zealand of the virus of any disease, whether or not such is in an attenuated form; and, further, that section 37 prohibits unauthorized persons to inoculate any stock with the virus of any disease, contravention of this section carrying a penalty up to £200.

It would appear that the law has recently been contravened in this respect, and a warning regarding the provisions of the Act is therefore issued.

The sections in question are as follows:—

20. Every person who wilfully, without the written permission of the Minister, introduces or causes to be introduced into New Zealand the virus of any disease, whether or not such virus is in an attenuated form, is liable to imprisonment for any period not exceeding two years.

37. Every person who, without the written consent of the Chief Inspector, inoculates or causes any stock to be inoculated with the virus of any disease, whether such virus is in an attenuated form or not, is liable for every such offence to a fine not exceeding two hundred pounds and not less than five pounds.

—*A. R. Young, M.R.C.V.S., Director of the Live-stock Division.*

Inoculation of Calves against Blackleg.—The calves inoculated in 1921–22 by officers of the Live-stock Division in the Taranaki and Auckland blackleg districts numbered 39,725 and 46,024 respectively.

FARMERS' FIELD COMPETITIONS.

TARANAKI, WANGANUI, AND FEILDING DISTRICTS.

J. W. DEEM, Fields Instructor.

IN the *Journal* for September, 1921, the writer gave an account of the field competitions in these districts, together with data regarding the crops grown. In the 1921-22 season the system was further extended, and now embraces fifty competitions at eighteen centres. After allowing for failures from various causes the following crops were finally judged by Instructors Glasson, Schwass, and the writer: Mangolds, 113; carrots, 62; swedes, 78; soft turnips, 30; lucerne, 42; maize, 6: total, 331, which is an increase of 104 crops for the year.

As in the preceding season, in most centres large numbers of farmers accompanied the judges from field to field, and some very profitable

THE SUTTON CUPS AND SAMPLES OF WINNING MANGOLD CROPS, SEASON 1921–22.
On left: H. G. Birch, Maxwelltown. On right: J. Dakers, Kaupokonui.

days were spent. In districts where the competitions have been going for several years there is practically no increase in the heaviest of the respective crops, but it is noticed that the general average has greatly increased and that there are now no poor crops. In one centre which started competitions two seasons ago the best crop of mangolds was 39 tons 11 cwt. and the average 32 tons 15 cwt. On reviewing the results it was observed that the average amount of fertilizer used was approximately 1 cwt. per acre. Suggestions were made that more manure should be used and a few other points given attention to. This year it was found that the average fertilizer used per acre was $3\frac{1}{2}$ cwt.; the best crop weighed 73 tons 12 cwt. and the average was 58 tons 14 cwt., a gain in the best crop of 33 tons 19 cwt. and an average gain for the district of 25 tons 19 cwt. The competitions were surely worth while in this district, and, needless to say, the local farmers are now very keen.

In addition to the prizes provided by the various committees running these competitions, several special prizes have been donated by persons and firms who recognize the educative value afforded. It is not possible here to refer to all of them, but special mention may be made of two handsome cups presented by the New Zealand agents of Sutton and Son (J. G. Ward and Co.) for the best crop of mangolds grown in the south Taranaki and Wanganui districts respectively. These cups have to be won three times (not necessarily in succession) before they become the property of the winner, and are open to all competitors in a properly organized field competition. The donors make no restriction as to whose seeds are to be used. In addition to these two the same firm is presenting a similar cup for the Feilding district. The contests for these cups have created a great deal of interest and added a great deal of enthusiasm to the competitions.

Last year the writer dealt at some length with the varieties, manures, and methods of sowing in the competitions. Previous data under these headings have been fully borne out during the past season, except that Grandmaster swede filled more winning places than any other variety, no doubt owing to the fact that it resisted dry-rot to a greater extent than most others.

In mangolds the heaviest crop was grown by J. Dakers, of Kaupokonui; variety, White Sugar; weight, 91 tons 11 cwt. per acre. This crop won the Sutton cup for south Taranaki, and the Wanganui district cup was won by H. G. Birch, of Maxwelltown, with a crop of Prizewinner weighing 88 tons. The average for all the competitions was 55 tons 1 cwt. per acre, against 49 tons last year.

The heaviest crop of carrots was 64 tons 9 cwt. per acre; variety, Matchless White. The average was 40 tons 1 cwt., against 31 tons 11 cwt. last year.

Swedes showed a falling-off owing to the ravages of dry-rot, practically every crop being affected. The average was 30 tons 14 cwt., against 36 tons 9 cwt. last year.

Some very fine crops of lucerne were seen, some of them obtaining nearly full points. Mr. E. Burke's crop again won the Otakeho competition.

APPLE FLESH-COLLAPSE.

FRUITGROWERS and others will be interested to learn that Mr. R. Waters, of the Department's Biological Laboratory, has succeeded in producing artificially a condition in apples indistinguishable from the disease known as flesh-collapse. Those who are aware of the extent of damage that has arisen from this affection, in local stores as well as after shipment, and of the previous absence of knowledge as to the cause, will appreciate the importance of any definite information as to the causative conditions. Such knowledge is essential to the further discovery of effective measures of control. Details of this investigation will appear in a subsequent issue of the *Journal*.

WINTON EXPERIMENTAL AREA.

OPERATIONS IN SEASON 1921–22.

W. ALEXANDER, Fields Instructor, Invercargill.

THE programme laid down for the Winton Experimental Area was closely followed during the past year. The growing importance of dairying in Southland has influenced the development of the work of the area along lines that are of special interest to dairy-farmers in the district—namely, pasture investigations and the growing of supplementary forage crops, both of which cannot fail to be of very great value.

PASTURE INVESTIGATIONS.

The notes on the 1920–21 season's operations, published in the *Journal* for October, 1921, gave particulars of the various pasture sowings, both pure and mixed, also definite results of carrying-capacity over a period from February until June, 1921. The present report carries on the information from the time when grazing was resumed in September of that year. Having by then erected a series of netted enclosures (12 ft. by 12 ft. in area) we were enabled to undertake, simultaneously with the grazing, the task of cutting a portion of the various pastures once a fortnight right through the growing-period. The results of these cuttings now afford interesting information, and are tabulated below, together with the total yields of green feed for the season.

—	1st September to 31st October, 1921.	1st November to 31st December, 1921.	1st January to 28th February, 1922.	1st March to 31st May, 1922.	Total Yields per Acre.
					Tons cwt. qr. lb.
Sections 1 and 2: Pure Sowings.					
Meadow-foxtail* ..	lb. ..	lb. ..	lb. ..	lb. ..	..
Meadow-fescue ..	19	22½	17	4½	8 10 0 10
Fiorin*	..	..	..	..	..
Perennial rye-grass ..	33	17	15	5	9 9 0 0
Cocksfoot	10	14½	9½	2½	4 18 2 16
Timothy	4	10	7½*	2	3 3 2 4
Crested dogstail ..	6	13½	6½	3½	3 19 2 15
Poa pratensis† ..	7½	18	11	4	5 9 1 11
Poa trivialis†	5½	13	7½	3½	3 19 2 15
Yorkshire fog	8½	12½	7½	3	4 5 0 5
Sections 3, 4, and 5.					
Short-rotation pasture ..	14½	15	20½	11	8 4 2 22
Permanent pasture ..	21½	18½	19	6	8 15 2 0
Temporary pasture ..	17½	15½	17½	7	7 15 0 27

* No weights given, owing to the large proportion of other grasses present in this plot.
† Weeds constituted at least 60 per cent. of this plot.

Stock had free access to all the pure sowings on Sections 1 and 2, and it was instructive to note that a very decided preference was

shown for timothy, which at no stage has been allowed to get away. Next to timothy the stock seemed to prefer cocksfoot, while such species as meadow-foxtail, meadow-fescue, perennial rye-grass, and crested dogstail were practically disregarded.

After the New Year a good deal of grass was going to waste, so the mower was put over the 10 acres constituting Sections 1 and 2. The following results in hay yield from each 1-acre plot show how the stock preferred certain species to the entire neglect of others: Meadow-foxtail, 1 ton 5 cwt.; meadow-fescue, 12 cwt.; fiorin, 3 cwt.; perennial rye-grass, 2 tons 5 cwt.; cocksfoot, 4 cwt.; timothy, nil; crested dogstail, 1 ton 5 cwt.; Poa pratensis and Poa trivialis, no growth worth cutting; Yorkshire fog, 1 ton 10 cwt.

The short-rotation pasture in Section 3 is an excellent piece of grassland, the main seeding being 40 lb. perennial rye-grass per acre. During the year this pasture has carried at the rate of seven sheep per acre, and for a considerable part of the time it was seven ewes with their lambs. Section 4, being a permanent-pasture mixture, had to be nursed for a time, consequently its grazing-capacity was not fully tested. However, at the end of the year this section had carried just over five sheep per acre, and the stock for a certain period were also ewes with lambs. Section 5, a temporary pasture whereof the base is Italian rye-grass, was grazed as heavily as was possible right from the start, and at the end of twelve months had carried six sheep per acre.

At the end of January each of these pastures was mowed for the purpose of removing the surplus growth. The yields of hay thus obtained, when added to the data of carrying-capacity, throw a good deal of light on the economy of temporary *versus* permanent mixtures, and also on the matter of pasture-management. The hay and grazing returns are as follows:—

—	Total Hay Yield from 5 Acres.	Grazing per Acre.
Short-rotation pasture	25 cwt.	7·4 sheep.
Permanent pasture	3 tons	5·8 sheep.
Temporary pasture	15 cwt.	6 sheep.

During the past winter a series of top-dressings was carried out on the various pastures, and it is expected that the effects will be a great improvement.

OATS FOR CHAFF.

Section 6 (5 acres) was devoted to an oat crop for chaff. The oats used for seed were an odd lot of varieties saved at Gore Area the previous year, and there was no attempt at separation. Sowing at the rate of 3 bushels per acre was carried out on 30th September, 1921. The manure used was 3 cwt. basic super per acre. Good progress was made right through, the crop being cut and stacked in February. The oats have not yet all been converted into chaff, but from the cutting of one stack the yield per acre can be reliably estimated at $3\frac{1}{2}$ tons of good, clean, bright chaff.

WHEAT VARIETY TRIALS.

As far as one can judge on one season's results this work, carried out on Section 7 (5 acres), is going to have far-reaching results. The experiment had for its object the finding of a variety or varieties that would mature earlier, yield better, and weigh heavier than our present generally used varieties. Five varieties were grown, three of which were brought down from North, while the remaining two were grown in Southland. The various points for comparison are set out in the following table. It will be seen that Major, supplied the previous year from the Marton Experimental Area, is quite outstanding.

Variety.	Date of Sowing.	Date of Harvesting.	Yield per Acre.	Weight per Bushel, dressed.
			Bushels.	lb.
John Brown ..	16/9/21	21/2/22	44·0	64
Major	16/9/21	21/2/22	62·4	65½
College Hunters ..	16/9/21	23/3/22	43·0	60
White Tuscan ..	16/9/21	8/3/22	57·4	63
Velvet Ear	16/9/21	15/3/22	49·9	63

Underlying the section on which this trial was carried out there exists a liming scheme, and its influence on the wheat crop is decidedly instructive. Running east to west across the paddock are five strips, four of which are limed, while the centre strip remains unlimed as a control or basis of comparison. Of the limed strips No. 1 has 1 ton crushed burnt, No. 2 2 tons crushed burnt, No. 4 3·6 tons carbonate, and No. 5 1·8 tons carbonate. Taking Nos. 1 and 2 as one group, the control area as a second group, and Nos. 4 and 5 as the third group, we find the liming influence on wheat varieties sown north and south across the lime strips to be as follows (all plots being of equal area) :—

Variety.	Burnt-lime Group.	Control (unlimed) Group.	Carbonate-of-lime Group.
	Bushels.	Bushels.	Bushels.
John Brown	10·8	4·16	9·15
Major	14·15	6·06	13·75
College Hunters ..	9·45	5·08.	9·15
White Tuscan	12·9	10·08	10·04
Velvet Ear	10·4	8·03	10·04

The outstanding points of the whole trial are (1) early maturity of Major and John Brown varieties ; (2) high average yield of Major ; (3) heavy bushel weight of Major ; and (4) influence of lime on yield.

GREEN FODDERS AND SWEDES.

Section 8 was laid down with the object of providing successive crops of green fodders and swedes that would carry on from February until August or even September.

The fodders were worked in two different groups. The first group was tested on a straight-out fattening-capacity, lambs being weighed on and off. With the later crops, however, we were content to accept

carrying-capacity and yield per acre as the guide. The first group comprised Kangaroo rape, broad-leafed Essex rape, Buda kale, Italian rye-grass and crimson clover, chou moellier, and Thousand-headed kale. The second group consisted of field-cabbage, Superlative swede, and chou moellier.

It must be pointed out here that one would require to allow a fairly wide margin of experimental error in summing up the results of the feeding-tests carried out on this section. Owing to the different crops coming in at varying times it was quite impossible to use the one draft of lambs for feeding-off purposes. With forward lambs of good type a week or two on fattening-feed makes a wonderful difference, whereas with lambs not so forward nor of such suitable type some weeks would be required to put on the finishing-touch. We had this to contend with, and on account of the variations in stock and weather conditions the following figures should not be accepted as a definite guide to the possibilities of each crop. Still, the order of their merit was plainly in evidence long before the figures were complete.

The first group shows the gain per 100 lb. of live weight, and the time is actually the days between weighing on and off, not the carrying-capacity of each plot, except in the case of the Italian rye-grass and crimson clover. With the last-named plot the lambs had to be taken away, as the feed was gone for the time being. The area of each plot is $\frac{1}{5}$ acre.

Group 1.

—	Gain of Lambs per 100 lb. Live Weight.	Number of Days grazing.
	lb.	
Kangaroo rape	6·5	21
Broad-leafed Essex rape	8·0	21
Buda kale	5·2	21
Italian rye-grass and crimson clover	8·1	13
Chou moellier	12·9	18
Thousand-headed kale	8·5	18

Group 2.

—	Yield per Acre.	Grazing-capacity.
	Tons cwt.	
Field-cabbage	24 4	27·1 lambs for 23 days.
Superlative swedes	45 19	42·2 wethers for 18 days.
Chou moellier	27 13	33 wethers for 18 days.

LINSEED.

Four acres of Section 9 were worked up for linseed, and the crop was sown on 26th September, 1921, the seeding per acre being 110 lb. machine-dressed seed, with 3 cwt. superphosphate per acre. The liming investigation described under Section 7 also covers the land in No. 9, so that the linseed crop, although designed for commercial purposes, actually carried an interesting experiment in that it showed up the effect on linseed of an application of lime made the previous year. The detailed results are as follows :—

Plot 1. Carbonate of Lime, 1·8 Tons.	Plot 2. Carbonate of Lime, 3·6 Tons.	Plot 3. Control (unlimed).	Plot 4. Burnt Lime, 2 Tons.	Plot 5. Burnt Lime, 1 Ton.
2,400 lb. seed from $1\frac{3}{5}$ acres (1,500 lb. per acre).		900 lb. seed from $\frac{4}{5}$ acre (1,125 lb. per acre).	2,400 lb. seed from $1\frac{3}{5}$ acres (1,500 lb. per acre).	

Total yield from 4 acres, 2 tons 10 cwt. 3 qr. 16 lb.

SWEDE AND SOFT-TURNIP VARIETIES.

The 1 acre remaining in Section 9 was devoted to the growing of swede and soft-turnip varieties, there being a total of some eighteen varieties. Some very satisfactory yields were obtained, the chief of which in swedes were the following (per acre): Hurst's Halewood

THE CROP OF FIELD-CABBAGES AT WINTON EXPERIMENTAL AREA.

Bronze-top, 44 tons 12 cwt.; Hurst's Best of All, 41 tons 14 cwt.; Hurst's Perfection, 42 tons 16 cwt.; Hurst's Gateacre Bronze-top, 38 tons 6 cwt. In soft turnips the best two were Colonial-grown White Globe, 51 tons 8 cwt.; and Hurst's Purple-top Mammoth, 54 tons.

MANURIAL TRIAL WITH COLLEGE HUNTERS WHEAT.

The 5 acres comprising Section 10 was subdivided into five 1-acre plots, each plot being treated separately as follows: (1) Control (unmanured), (2) Nauru phosphate, (3) basic slag, (4) superphosphate, and (5) basic super, each 3 cwt. per acre. Sowing at the rate of 3 bushels seed per acre was carried out on 12th September, then, on 1st November, over 1 acre running across the end of each manurial section there was applied a top-dressing of 100 lb. nitrate of soda.

Owing to infestation by yarr (spurrey) the crop on this section had a struggle for its existence—in fact, it was only retained that we might try extreme measures to get the yarr down. On 1st December the yarr easily had pride of place, but on 2nd December a mob of eighty ewes and eighty-eight lambs was turned in. The stock remained there for seven days, then the chain harrows were put over the land, and the wheat was given a chance to come away for a crop.

When the ripened crop was harvested care was taken to stack each 1-acre plot by itself, and later the same care was taken during threshing operations. At the same time the very fact of the entire growth having been eaten down during the first week of December, and the resultant manure harrowed in, simply meant that the manurial scheme was nullified to such an extent that the actual yields recorded give no data with regard to the comparative values of the manures for wheat-production. It is of interest, however, that in the end the 5 acres yielded an average of some 30 bushels of good-quality grain per acre—and that, moreover, with a winter wheat sown in the spring and fed off heavily in December.

GENERAL.

In addition to the work undertaken on the various numbered sections, an effort is being made to establish lucerne on the railway paddock, and to renovate the old pasture on King's paddock. So far we have not got farther than the growing of a cleaning crop on the land intended for lucerne, but this season we hope to have the lucerne sown. Regarding the renovation of old pasture, this is being attempted through the agency of lime and phosphatic top-dressings. The application of these manures is too recent to permit comment, but should provide good matter for a special article later on.

In all the work of the Winton Area the Department has been fortunate in the Overseer, Mr. W. Campbell, without whose interest the detailed work would not be so satisfactorily accomplished. Mr. Campbell takes a personal interest in everything connected with the area, and to him is due a great deal of credit for the success that it is achieving.

SECTION NO. 6 AT THE WINTON AREA TURNED UP TO THE WEATHER.

THE SIGNIFICANCE OF APOTHECIA IN THE CONTROL OF BROWN-ROT OF STONE-FRUITS.

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THE apothecia* of brown-rot fungus of stone-fruits, *Sclerotinia cinerea* Schroet., were first discovered in North America by Norton in 1902, in Europe three years later, and in England by Wormald in 1921, but were not obtained in Australasia until last year, when Harrison obtained specimens in an apricot-orchard at Pennant Hill, near Sydney. The occurrence of these fructifications in New Zealand was first recorded last month, a brief note to that effect having been published in the September issue of this *Journal*.

Until the time mentioned brown-rot had been known here only from the conidial stage, so familiar to all growers of stone-fruits. For several seasons past search had been made for apothecia, but without avail. It was consequently decided to initiate a series of experiments—based on those successfully carried out in North America by Ezekiel—with a view to inducing the production of apothecia. In order to get as wide a range of climatic conditions as possible, one series was undertaken near Hamilton, in the Auckland Province, and another at Christchurch, in Canterbury, a range of about 6 degrees of latitude being thereby secured.

At the Ruakura Farm of Instruction (near Hamilton) one series of experiments was undertaken by Mr. T. Roach, Horticultural Overseer, who, with the concurrence of Mr. A. W. Green, Farm Manager, collected about one thousand of last season's mummies (peaches, nectarines, and plums) and half-buried them in soil in the orchard at the base of a large peach-tree. A similar series was carried out at Christchurch by Messrs. L. Paynter and W. K. Dallas, Orchard Instructors. Here the mummies were placed in trays at varying depths in the soil. Certain specimens were subjected to low temperatures by being placed for a time in a freezing-chamber, with the object of hastening production of apothecia. These experiments have been carefully watched during the blossoming-period, but no apothecia have appeared on any of the mummies. The significance of this will be discussed below.

Meanwhile a careful lookout was being kept for fructifications in the orchards, with the result that on 11th September Mr. Roach obtained a few immature specimens. From this date to 30th September he obtained abundant specimens. The mummies were mostly half-buried, but in many instances were completely covered, some being found at the depth of $1\frac{1}{4}$ in. Those lying on the surface and half-buried were obviously the past season's mummies, as they were quite large and fresh, several being upward of $2\frac{1}{2}$ in. in diameter. On these numerous apothecia appeared, eighteen being counted on one mummy which had been half-buried. In the case of many of the buried specimens, on the other hand, little of the mummy remained save the stone and black sclerotia from which the apothecia were growing. In the latter case

* An explanation of apothecia and their incidence in the life-history of the brown-rot organism will be found on page 90 of the *Journal* for August last.

it is probable that the mummies were more than one season old. In all Mr. Roach has forwarded to this laboratory upwards of 200 apothecia of varying size and age, most of which were on peach-mummies, but a few were on nectarines. The trees were blossoming during the whole of this time, and blossom-infection first became noticeable on 30th September. Preceding blossoming the weather was somewhat showery, but continued dry and frosty during blossoming.

On 15th September Mr. L. Paynter obtained apothecia growing from plum-mummies in the orchard of Mr. Elwood, Woolston, Christchurch. The mummies were all recent ones, and were lying around the base of a plum-tree (Angelina Burdett) which had been badly infected last season with brown-rot. Most of them were just covered, but some were buried fully 2 in. deep, while an odd one was found to be 3 in. below the surface of the soil. On those lying near the surface as many as eight to ten apothecia were present; others had less; and those which had been buried most deeply had but one. In all cases they were obtained from compacted soil left between the rows of trees during ploughing, and none could be found on the recently cultivated land. Mr. Paynter states that at the time of his visit spore-discharge was actively going on, as he could distinctly see the spore clouds above the apothecia. He obtained further material from the same locality on 29th September, and at this date blossom-infection was noticeable on the trees under which the apothecia were obtained. At the time of his first visit the trees were in full bloom, but on the second visit most of the petals had fallen. On 30th September Mr. Paynter obtained apothecia growing from peach-mummies in the orchard of Mr. Shields, Horatane, under trees of the variety Briggs's Red May. The mummies were quite 2 in. underground, and were probably more than one year old. The weather during September was comparatively fine, bright sunny days, cold nights, and occasional showers being experienced.

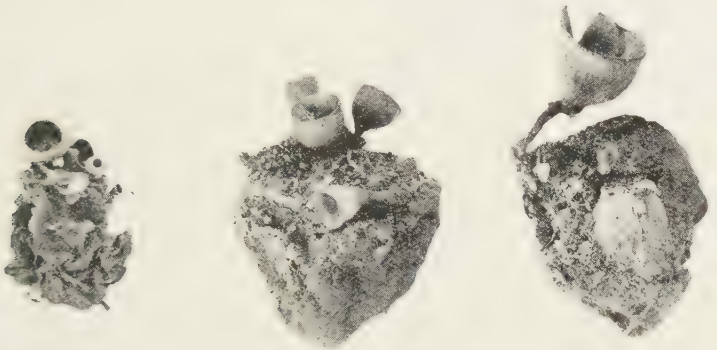
On 21st September Mr. Dallas obtained specimens of apothecia from peach-mummies lying under a tree of the variety Royal George, which had for several seasons past been badly infected with brown-rot. This tree was located in the orchard of Mr. A. S. Pearce, Heathcote Valley. The mummies were buried about $\frac{1}{2}$ in. below the surface; from their appearance it is my belief that they are more than one season old. They were obtained from compacted soil at the base of the tree, none being observed on the portions of the orchard which had been cultivated in July. The trees were in full bloom at this time.

DETAILS OF STRUCTURE OF THE MUMMIES AND APOTHECIA.

Specimens of apothecia were despatched to this laboratory as soon as found, where they were examined by the writer. They vary considerably in shape according to age and the depth at which the mummies were buried. At first they are urn-shaped, with the margins turned inward, so that the hymenium or spore-bearing surface is protected (Fig. 1, *a*), later becoming cup-shaped (Fig. 1, *b*), and, finally, at maturity they are quite saucer-shaped, when the under-surface appears frequently to lie flat on the ground, the margins at this stage being much lacerated. In size they range from about $\frac{1}{12}$ in. in diameter in the case of immature specimens to $\frac{3}{4}$ in. in mature ones. The length of the stalk varies according to the depth at which the mummies are buried in the soil, those lying on the surface producing apothecia with quite short stalks ($\frac{1}{2}$ in. or less), while in the case of deeply buried ones—since the stalk

must be of sufficient length to enable the apothecium to reach the surface—a length of 2 in. or more may be obtained (in one specimen the stalk is actually $3\frac{1}{4}$ in. in length). The apothecia are usually dingy brown when fresh, but change with age to dark brown. Should the mummy be lying on the surface the apothecia are produced at point of contact with the soil; in half-buried mummies they appear at the meridional line; while those formed on completely buried mummies appear to be produced from the portions nearest the soil-surface.

When the mummies are more than one year old the sclerotia, as a rule, are all that remain, their presence becoming noticeable owing to the production of apothecia from them. They are usually irregular in shape, quite black, and are either attached to the stone or else isolated and partly buried, so that apothecia may appear in soil in which stones cannot be found. As to the formation of these mummies,



a *b* *c*

FIG. 1. APOTHECIA OF BROWN-ROT ON PLUM-MUMMIES.

(Material found by Mr. L. Paynter at Christchurch.)

(*a*) Urn-shaped immature specimens; (*b*) and (*c*) cup-shaped mature specimens. The mummy in (*c*) was buried 2 in. underground; note the long stalk of apothecium. [*Photo by W. D. Reid.*

it will be remembered that following infection of maturing fruits the hyphæ ramify through the tissues and finally completely fill them. When these infected fruits fall to the ground the mycelium undergoes a slight change, becomes darker in colour and more compacted, forming sclerotia, which, according to Pollock (1918), have been known to remain viable for as long a period as ten years.

Microscopic characters of the apothecia agree in most respects with the descriptions of the European form; they will be discussed at length in a technical paper to be published elsewhere.

On 15th September ascospores were isolated and inoculated into apple-fruits (the only fruit available) with a view to testing their pathogenicity. In seventy-two hours small brown areas 3 mm. in diameter had developed and in ten days had spread until half the fruits were rotted. No conidia appeared on the surface until eighteen days later, the fruits meanwhile becoming dark and assuming the characteristic appearance of those infected with brown-rot. In the field blossom-infection has been observed (material has in all cases been forwarded for verification) on those plums and peaches under which apothecia were obtained.

EFFECTS OF ASCOSPORE INFECTION.

As was shown in the article published in the *Journal* for August last, brown-rot may appear either during the blossoming-period or about the time of maturity of the fruits. Infection at blossoming-time may be due to (1) conidia produced from mummies hanging on the trees, (2) conidia produced from lesions on branches formed the previous season, or (3) ascospores produced from mummies lying on the ground.

Ascospores play an important part in spreading the disease, as at the time of their discharge from the apothecia the trees are blossoming freely and are in consequence liable to infection, when the blossoms are killed, the hyphæ growing through the flower-stalks into the laterals, upon which small cankers are formed ; or the laterals may be infected directly by ascospores, and cankers be formed. It is thus obvious that however carefully all mummies and cankered shoots may have been removed during pruning operations infection from ascospores may still occur in the spring. Cankers formed as a result of ascospore infection persist during the whole of the growing season, and wherever the weather conditions are favourable produce conidia, which in turn may infect developing fruits or leaves.

FACTORS FAVOURING THE PRODUCTION OF APOTHECIA.

Production of apothecia appears to be governed by (1) weather conditions, (2) depth at which mummies are buried in the soil, (3) age of mummies, and (4) conditions of soil at the period of production.

(1.) Showery weather preceding and during the time of appearance of apothecia, accompanied by warm days and cold nights, seems favourable to their production, as such conditions were present both in Ruakura and Christchurch.

(2.) As here shown, apothecia have been produced from mummies lying on the surface, from half-buried mummies, and from mummies buried to a depth of 3 in. As their number decreased with the depth in the soil (eighteen or more being present on peaches lying on the surface, and ten on one or two plums, whereas at 3 in. only one apothecium occurred) it would appear that depth of soil directly controls their production. This partly agrees with American experience, where Ezekiel found that production of apothecia was actually prevented if the mummies were buried to a greater depth than 2 in.

(3.) The majority of the specimens forwarded were obviously products of the past season's infection. They were large, plump, and very similar to those found on the trees, so that at most they could not have been more than nine months old. This agrees with the observations made in America by Roberts (1921). Several apothecia appeared on the surface which were attached to sclerotia only, all remains of the mummy, and in some instances even of the stone, having disappeared. It is probable that these were more than one year old, and had become desiccated, the sclerotia in some cases having been separated from their stone during cultivation. All plum-mummies (see figure) forwarded by Mr. Paynter were obviously the result of the past season's infection.

(4.) Conditions of the soil, at any rate in New Zealand, appear to play a more important part in apothecial production than is generally realized. For example, in both series of experiments mummies were

buried in loose soil which was not in any way compacted, but no apothecia appeared. At Hamilton their production may have been inhibited in part by frost action, which lifted most of those buried to the surface of the ground. All specimens found in the orchards, however, were obtained from hard and compacted soil, such as commonly occurs on areas left untouched by the plough between the rows of trees, or round the trees as a result of trampling during pruning. On cultivated land in the vicinity none were obtained, so it would appear as if compacting of the soil around the mummy were essential to the production of apothecia. The presence of weeds has little effect on production, as apothecia were equally common in ground covered with weeds or weed-free, although those growing among weeds were more advanced. It is difficult to assign any reason for this, other than that a compacted soil would tend to hold moisture for a longer time in the vicinity of the mummy.

CONSIDERATIONS REGARDING CONTROL.

It is interesting to note that in no instance were apothecia found on any land that had been cultivated within three months previously, thus indicating the possibility of preventing the formation of apothecia by cultivation of the land after pruning and before blossoming. This would necessitate the breaking-up of all portions left untouched by the plough, especially those small areas remaining at the bases of trees after cross-ploughing. Further experimental work next year will be necessary before this treatment can be recommended with certainty, but, judging from the present data, favourable results should be obtained. This would not necessitate any extra work on the part of the orchardist, but merely a possible alteration of the time of spring cultivation. Control methods on these lines may be tentatively given as follows: (1) During pruning operations remove all mummies, cankered limbs, and dead and weakly laterals; (2) pick up all these prunings, together with all mummies, and destroy, preferably by burning; (3) cultivate subsequent to pruning but before blossoming, turning under by hand all portions left untouched by the cultivator, the idea being to break up all compacted soil; (4) spray according to the schedule set out in the *Journal* for August last (page 93).

It may here be pointed out that blossom-infection by brown-rot is followed by destruction of the petals, anthers, and ovaries, and that infection is rapid, death in some instances following within a few days after infection. Therefore during ascospore-discharge preventive sprays would have little value unless applied at intervals of four or five days during the blossoming-period, which would be impracticable in orchard practice. Thus the prevention of apothecial formation becomes very necessary in the control of this disease. This recommendation differs from that in black-spot control, where spraying is recommended in preference to the attempted destruction of dead leaves bearing perithecia, which would be difficult if not impracticable. The reasons are that apparently the formation of apothecia may be prevented by cultural operations, obviating the necessity of any extra work on the part of the orchardist, whereas the same treatment would not suffice in the case of dead leaves bearing the perithecia of black-spot, as the leaves may be carried to localities where it is not possible to bury them beneath the soil. Furthermore, orchard experience has shown that

infection from ascospores of the black-spot organism may be entirely prevented by three spray applications, whereas the same sprays are of little use in the prevention of brown-rot during the same period, due no doubt to the greater susceptibility of stone-fruits to attacks by the fungus causing brown-rot.

CONCLUSION.

An expression of thanks is due to Messrs. T. Roach, L. Paynter, and W. K. Dallas for the careful manner in which they carried out the experiments here related, and collected field data. It is, in fact, mainly upon their field observations that this article is based. It may be mentioned that a small quantity of herbarium material is available for distribution to any mycologist interested in the brown-rot organism.

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LIME-DEVELOPMENT.

THE annual report of the Department of Agriculture for 1921–22 states that the Lime Committee has continued to confer when necessary, and to advise groups of farmers and others on matters relating to the development of limestone deposits. The following general policy with regard to lime-supply development was formulated, and approved by the Minister of Agriculture: (1.) That every application for assistance in supplying lime to a district should be considered on its merits. (2.) Where possible, without incurring unusual expense, the district and deposits should be inspected by officers of the Agriculture and Public Works Departments, and advice given as to the best method of increasing the supply. (3.) Only under very exceptional circumstances and after full inquiry should the Government subsidize by a money grant any organization for supplying lime to a district for agricultural purposes. (4.) All limestone deposits on Crown lands should be reserved to the Crown. (5.) Further legislation with the intention of giving power to the Government to take land from time to time for lime-quarries appears to be unnecessary, as such power is given by the Public Works Act (Consolidated), 1908. Areas taken under this Act can be leased to private individuals to work as lime quarries or works, and, provided the necessary money is voted by Parliament, the work automatically becomes a "public work" under the Act. (6.) The Committee would broadly advise that the policy of allowing lime-development to proceed by private enterprise, assisted merely by Government advice, should be the keynote of the Government's policy, exceptional cases to be met by exceptional methods. The Committee is collecting evidence as to lime deposits suitable for agricultural use occurring on Crown lands, with a view to the reservation of those which are suitable and necessary for the district. [The Lime Committee consists of the Chemist to the Department of Agriculture (convener), the Engineer-in-Chief of the Public Works Department, and the Director of the Geological Survey.]

THE RAM AND HIS CHARACTERISTICS.

J. G. COOK, Wool Instructor, Live-stock Division.

FREQUENT inquiries are received by the writer as to what constitutes a good ram, and an endeavour is made in the following notes to present the main features which are essential for success.

There are several important characteristics which a ram must possess when it is intended to purchase, or, having bred the animal, to keep him, for propagating purposes. These characteristics are constitution, trueness to type, vitality, virility, character, good bone, conformation, and wool of as even a quality as possible possessing character, density, and length.

The most important quality is constitution, strength, hardiness, and robustness, because it is the foundation of the animal. Having this, providing he receives the feed he requires and some shelter which he can make use of during severe weather, the ram is able to develop and bring all the other qualities he possesses to the highest point within his power. A sound constitution should be every breeder's aim, as it means less trouble and work, therefore less worry, than when the animal has to be hand-nursed. The only way to secure constitution is by mating the strong with the strong. Further, the progeny should never be pampered.

It does not matter which breed the ram is from, he must be as true to his type as it is possible to get him. Each line or breed has its own particular type, and it should therefore be seen that he possesses all the requisite points. A little time given to careful examination is well spent. See that he is as good as can be got (or financial circumstances will allow) before mating him. As a rule a good ram is worth more than the price paid for him.

Vitality comes next, as the ram must be able to withstand all calls made upon him whether by nature or otherwise. With good vigorous vitality he survives and quickly recovers from any reverses he may meet with.

Virility is very necessary. As the ram is only kept for one purpose it is advisable that careful attention be given to his generative organs prior to mating, in order to observe whether any injury has taken place. There is an advantage in keeping young rams, as their virility is greater, therefore they are keener workers, and the result is always apparent at lambing-time. The old ram has lost a great deal of his keenness.

Character is required, and will always show when it is there, by the conformation, bearing, and general carriage, with a leadership look about him. This is true reflection of his breeding, and always bespeaks a good pedigree. The way to breed character in is by mating the best with the best.

The bone should be strong, as it is the framework and support of the animal. Any defect in this respect should put a ram out of consideration.

The conformation should be of a general uniformity throughout. The head should be well set on, with a strong masculine appearance,

good crest, fair width between the eyes and ears, orbits nice and full, jaws strong, in line, and nicely rounded at the mouth so as to come together evenly, teeth level and strong, the cutting-teeth in the lower jaw to fit evenly against the cartilaginous pad in the top jaw. There should be a good scrag, strong neck and wither, complete absence of "devil's grip,"* large full shoulder, nice broad back with ribs well sprung from backbone and feeling solid with good spring, good loin, rounded rump, full thigh, and a deep wide chest so as to allow plenty of room for the heart and lungs to do their work properly. This means a large girth, a well-balanced body, with nice strong legs nicely set apart, with good knees and hocks, strong springy pasterns and fetlocks, and muscles firm and strong. Hoofs of black or deep amber are to be preferred, these appearing to be harder and capable of offering greater resistance to wear and any hoof trouble. Some breeds have large hoofs for the size of the animal.

The wool should be of as even a quality all over as it is possible to get it. Of course, there is always a slight difference in the quality growing on the fore part of the sheep and that growing on the hind quarters. "Quality" implies that the wool must possess character, trueness in the fibre, lustre, soundness, elasticity, pliableness, evenness, fineness according to breed, free growth, density in fibre and growth, length, shaftiness, colour, and yolk. The hair growing on the face and legs is a good indication of the quality of the wool grown by the animal; the hair close to the ears should have a soft downy feel. Character in the wool is signified by the waves or crimp in the fibre being the full length of it—that is, from the base right out to the tip. Such wool possesses elasticity, pliability, and softness. When wool has this quality it is referred to as "full of character," a very desirable feature in all wools. Trueness in the fibre means having the same diameter throughout its length, and the waves or crimp even in shape and the same distance apart from base to tip. Lustre is required, but it varies with the different breeds. Soundness is shown when the wool will stand a strain or tension put upon it without breaking. As regards elasticity, the wool should stretch when tension is applied, and upon being released should immediately return to its natural length. The true length is ascertained when the wool is stretched. Evenness implies the same quality all over. It has already been pointed out that there is a slight difference, but the wool must not be fine on the fore part and going to hair on the hind quarters. This is termed "run out," and any ram having this serious fault must be culled out. As regards fineness, each breed has its own particular form, but it should be a robust fineness. Every breed also varies in length, but the wool must be long enough for combing purposes. With Merino rams the ones with the longest-grown wool should be chosen in preference to those whose wool is short; also, the horns should take an even curve away from the head. Density is valuable, as it signifies a more copious growth of wool on the area of skin and indicates carefulness in breeding. Dense wool offers greater resistance to the dirt and weather element, and such wool always feels solid. "Plenty of body in it" describes such wool, and it cuts a good weighty fleece. Wool that has no density

* "Devil's grip" is a depression behind the shoulder, and indicates weakness.

is light and open, and the weather has full play upon it, which dries out a lot of the yolk, causing depreciation, the result being an unduly light fleece. Shaftiness means a good compact vigorous growth and nice length. Yolk is the natural preservative of the wool, and varies in quantity and quality according to the breed. A healthy free flow of yolk is desirable; it acts as a protective in resisting wet, assists the growth of the wool, makes the wool soft and pliable, and keeps the fleece from becoming cotty or matted.

Every breed possesses its own distinctive qualities of wool, from the long lustrous Lincoln and English Leicester, the demi-lustre Border Leicester and Romney Marsh, the blocky stapled Corriedale, the various Down races (Shropshire, Suffolk, Southdown, &c.), the Ryeland, to the Merino. In the ram the general features or characteristics of his breed must show clearly. A rubbishy one is dear at any price, as he will give endless trouble if mated.

If unable to buy enough good rams in one season for the whole of the ewe flock, the farmer should purchase one or two good animals, select fifty of his best ewes for each ram, mate them, and mark the ewes put with each ram, also keeping a record of it in the notebook. Let the ewes run on the country they are going to rear the lambs on. When lambing takes place mark the lambs with the same mark as the ewes, afterwards making a selection of the best ram lambs for keeping, and when they are old enough mate them with the other flock-ewes. In this way the quality of the flock will be gradually built up.

The class of ram *not* to use is one which possesses any of the following faults: Weak constitution, feminine head, narrow face, pinched peaky nose, overshot or undershot jaw, thin or short neck, small defective shoulders, "devil's grip," narrow back, pointed rump, flat thighs, slab-sided soft ribs, narrow brisket, thin bone, legginess, defective knees, hocks, pasterns, and fetlocks, or uneven quality of wool. Whatever faults the ram may have will show up in his progeny. The ram that is growing wool of an uneven quality—that is, fine on the fore part and running to hair on the hind quarters or with no crimp in it—if bred with will only cause trouble in the wool-clip, as the wool grown by the progeny will also be uneven in quality, and extra lines will be needed when classing it. Once started in a flock this means a lot of trouble, and it may take years of careful culling to get the unevenness out of the clip. Such a ram can be termed a "brummy," and the best thing to do is to castrate him at once. With an even flock classing is easier, as the lines are larger and not so numerous, resulting in higher prices for the clip. Better prices will also be received for the rams or ewes when sold, as they are an even line and what the man just starting is looking for.

Orchard and Garden Diseases.—Downy mildew of grape and Indian-meal moth have been declared diseases within the meaning of the Orchard and Garden Diseases Act, and included in the Second Schedule of the Act.

Importations of Stud Stock.—The following importations of stud stock into New Zealand from overseas were made during the year ended 31st March last: Cattle, 22 head (5 Shorthorn, 14 Jersey, 3 Ayrshire); sheep, 10 (7 Hampshire, 3 English Leicester); swine, 13 (8 Berkshire, 2 Tamworth, 3 Yorkshire); horses, 16; goats, 11 (10 Anglo-Nubian, 1 Toggenburg).

STRATFORD DEMONSTRATION FARM.

SUNDRY NOTES, SEASON 1921–22.

J. W. DEEM, Supervisor of Subsidized Demonstration Farms.

At the last annual meeting of the Farm Society it was decided to change the name of the Stratford Model Dairy Farm and Experimental Area to the Stratford Demonstration Farm, and it will in future be referred to under this title. The work of the farm in 1921–22 continued much on the lines of previous years, except that owing to the low price of butterfat making itself felt in the finances of the farm the volume of experimental work had to be reduced to some extent.

It was mentioned in last year's review (*Journal*, October, 1921) that the benefit of resowing and top-dressing of pastures was beginning to make itself felt in the milk returns. This increase has continued,

TWO OF THE SWEDE VARIETIES AT THE STRATFORD DEMONSTRATION FARM.

On left: Vilmorin's Green-top White. On right: Vilmorin's White-fleshed Purple-top.

the returns for the past yearly period showing an increase of 2,257 lb. butterfat, the figures being 14,945 lb. against 12,688 lb. in the previous year. The average butterfat production per cow in the same period increased from 253·7 lb. to 287·4 lb.

ROOT CROPS.

With the exception of swedes, which suffered badly from dry-rot, the root crops were good. Last year I went fully into varieties and manures, but as only standard manures were used in the past season the present notes will be confined to varieties.

Mangolds: Several varieties were tested, but Prizewinner again gave the heaviest crop, with White Sugar and Jersey Queen equal next. The addition of salt at the rate of 3 cwt. per acre gave an increase of 10 tons per acre, again confirming previous years' findings.

Carrots: Matchless White again gave the heaviest crop—in fact, the heaviest that has been grown on the farm—48 tons 6 cwt. per acre; Rennie's White was second with 43 tons 12 cwt., and Sinclair's Champion third with 36 tons.

Swedes: Sixteen varieties were tested and fourteen different mixtures of manures used, but practically the whole crop was affected with dry-rot, notwithstanding the fact that the land used had been only just broken out of stumps and had not previously been cropped. The ground, no doubt, was contaminated by cows using it as a run-off from the adjoining area last year, coupled with the fact that it was in the line of prevailing winds. The only swede that was fairly immune from dry-rot was Vilmorin's White-fleshed Purple-top. It may be mentioned that in another swede test carried out near Stratford seventeen varieties were grown, and with the exception of three white-fleshed varieties all were affected with dry-rot. The three clean varieties were Burpee's Large White and White Neckless, and Dreers Budlong's Improved White. From these results it would appear as if white-fleshed swedes are not so susceptible to dry-rot as the yellow varieties. This point will be further investigated.

Soft turnips were grown on lines similar to those of the previous season, as also were various green forage crops.

LUCERNE.

The lucerne area mentioned last year has done fairly well, and the results so far are interesting, particularly as between the cow-grass and lucerne and the effects of manure against no manure. In each case the effect of manuring was very pronounced, the manured area coming away more rapidly and carrying a better colour from the start. At the time of writing the manured areas are looking splendid, while the unmanured control areas are sickly, with a number of yellow patches. The following table gives the results of two cuttings last summer, the manure used being basic slag at a rate of 3 cwt. per acre :—

Plot No.	Variety.	Method of Sowing.	Yield of Green Material.			Remarks.
			T.	cwt.	lb.	
1	Grimm	21 in. drills	10	2	70	..
2	Marlborough	21 in. drills	11	11	56	..
3	Marlborough	21 in. drills	10	15	14	No manure.
4	Marlborough	14 in. drills	11	8	32	No manure.
5	Marlborough	14 in. drills	13	10	0	..
6	Marlborough	7 in. drills	15	15	0	..
7	Marlborough	7 in. drills	9	6	38	No manure.
8	Marlborough	Broadcast	9	15	72	..
9	Cow-grass	Broadcast	14	6	10	..

Noxious Weeds.—Recent declarations under the Noxious Weeds Act by local bodies include the following: Japanese wineberry—Cook, Waikohu, and Uawa Counties; cut-leaved psorolea—Hobson County; hawthorn—Mount Eden Borough and Lower Hutt Borough.

TESTING OF PUREBRED DAIRY COWS.

CURRENT CERTIFICATE-OF-RECORD LIST.

THE following list, comprising the records of cows which qualified for certificates during July, August, and September, 1922, is supplied by the Director of the Dairy Division, Mr. W. M. Singleton :—

LIST OF RECORDS.

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.					
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Wairere's Dairymaid	A. Faull, Stratford ..	2 18	242·3	361	8,449·2	517·42
Noelena	A. J. Hale, New Plymouth	1 242	240·5	361	6,969·2	440·33
Maori Flirt ..	H. B. Lepper, Lepperton	2 0	240·5	365	7,574·45	438·76
Lady Nova ..	R. F. Wilkinson, Pukekohe	1 326	240·5	364	9,230·9	431·14
Spotswood Edna ..	W. H. Jury, Spotswood	1 360	240·5	325	7,040·2	419·63
Ensley Maid ..	R. F. Wilkinson, Pukekohe	2 9	241·4	365	6,376·7	416·60
Rosy Creek Song ..	D. P. F. Malone, Riverlea	2 54	246·4	326	8,482·6	416·49
Willow Bank Tester	W. Johnson, Ngaere..	1 341	240·5	320	8,133·5	404·52
Portland Lady ..	H. J. Lancaster, Levin	2 14	241·9	365	6,316·5	403·70
Rata's Princess Violet	J. K. Dean, Te Kumi	1 343	240·5	332	6,779·5	402·45
Little Lady Pauline..	T. West, Tikorangi ..	1 354	240·5	323	7,235·9	400·78
Ensley Pearl ..	R. F. Wilkinson, Pukekohe	1 343	240·5	354	7,301·6	382·18
Grannie's Campanile Rose	T. Dickson, Westown	1 308	240·5	365	6,134·5	369·18
Bridge View's Pearl..	A. L. Hooper, Mahoe..	1 362	240·5	315	6,248·9	365·00
Oakdale Mag ..	L. K. Tarrant, Ngaere	1 360	240·5	314	6,777·5	363·82
Netley's Maid ..	F. J. B. Ryburn, Ohaupo	1 273	240·5	365	6,093·5	356·94
Aly's Marcus Beauty	A. L. Hooper, Mahoe	1 340	240·5	308	6,401·9	347·85
Tower View Princess	J. B. Laurenson, Hawera	1 313	240·5	362	4,876·7	344·73
Kudo's Betty ..	E. Harding, Woodville	1 313	240·5	301	6,442·2	327·13
Victoria's Charm ..	E. A. Harrington, Hukanui	2 91	249·6	365	6,075·7	317·58
Willow Bank Dairy Queen	W. Johnson, Ngaere..	1 317	240·5	350	5,959·1	305·72
Passion's Beauty ..	C. Jones, Manaia ..	1 361	240·5	335	6,651·7	304·80
Lady Victor of Bull's	F. J. Watson, Bull's..	2 17	242·2	365	5,604·4	286·02
Jersey Brae's Promise	T. J. V. Dunlop, Paeroa	2 1	240·6	278	4,669·5	270·53
Ardenlea's Hope ..	J. G. Short, Bell Block	1 326	240·5	365	5,502·0	262·35
Awakeri Kate ..	F. Gough, Awakeri ..	1 346	240·5	312	5,868·2	254·13
Paerata's Daisy ..	F. H. Hooper, Piopio	1 331	240·5	256	4,536·0	247·17
Senior Two-year-old.						
Berenice	A. N. Haylock, Stratford	2 320	272·5	365	9,059·9	547·69
Myrtle's Miro ..	H. C. Sampson, Hillsborough	2 244	264·9	365	8,511·1	467·25

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
Senior Two-year-old —continued.	JERSEYS—*continued.*	Yrs. dys.	lb.		lb.	lb.
Jenny's Lass ..	A. Mouldey, Tirau ..	2 329	273·4	317	8,360·3	421·98
Lady Kaepe ..	G. A. Berry, Manaia..	2 275	268·0	349	7,344·4	379·83
Rewa Mayplay ..	G. T. Gibbons, Ngaere	2 351	275·6	326	6,675·7	370·86
Rewa Furze ..	G. R. Bell, Waipuku..	2 354	275·9	306	6,636·5	358·85
Coquette Irene ..	C. Stevens, Maungatapere	2 281	268·6	365	5,108·5	319·56
Three-year-old.						
Snow View's Pride ..	D. P. F. Malone, Riverlea	3 338	310·8	365	9,924·5	586·04
Sappho's Model ..	S. Dale, Fairlie ..	3 251	302·1	365	8,716·3	547·13
Oakland's Princess ..	F. W. Cornwall, Bell Block	3 35	280·5	300	8,942·4	514·36
Blackberry Chase ..	A. J. Dempsey, Horsham Downs	3 217	298·7	319	9,086·3	510·76
La Bologna ..	O. Monrad, Palmerston North	3 291	306·1	316	7,774·5	487·11
Oakland's Aline ..	J. Nicholson, Manakau	3 262	303·2	359	8,036·85	474·63
Cowling's Maid ..	G. E. Cowling, Manaia	3 364	313·4	312	7,945·0	454·46
Vega's Maid's Lady..	T. Foreman, Alton ..	3 311	308·1	335	7,338·4	453·24
Golden Sunflower ..	James Harris, Bombay	3 33	280·3	365	8,243·4	440·94
Ivondale's Heather ..	P. J. Peterson, Brixton	3 348	311·8	268	8,002·6	417·38
Souvenir's Joy ..	F. H. Hooper, Piopio	3 339	310·9	291	7,650·5	388·08
Victoria's Ideal ..	W. J. Murray, Opotiki	3 298	306·8	325	8,227·5	371·09
Jacinta	A. R. Bayly, Omata..	3 46	281·6	365	5,675·8	360·51
Aratika Faustina ..	D. Kennedy, Morven..	3 33	280·3	295	7,162·5	351·6
Yvonne	G. A. Berry, Manaia..	3 16	278·6	311	6,182·4	318·62
Waipiko Joletta ..	C. G. C. Dermer, Waipiko	3 59	282·9	193	6,279·0	313·52
Four-year-old.						
Brelade's Countess ..	J. Fulton, Whangarata	4 322	345·7	365	11,037·4	680·55
Holly Bank Orange Lady	S. J. Bennett, Kaupokonui	4 30	318·5	365	10,240·4	612·45
Belva	A. Faull, Stratford ..	4 8	314·3	365	9,011·2	581·11
Flox	A. Moreland and Son, Te Rapa	4 114	324·9	365	8,218·5	573·99
Aberbrothock Flo ..	W. P. Begg, Arapohue	4 343	347·9	365	10,291·0	554·61
Oakdale's Lass ..	J. Poletti, Bell Block..	4 338	347·3	320	7,927·0	485·42
Waipiko Bronze ..	H. A. Lurman, Otorohanga	4 323	345·8	325	7,376·3	453·44
Snow View's Promise	K. Rothe, Riverlea ..	4 193	332·8	365	8,331·8	447·12
Avoca's Rosalie ..	F. W. Green, Stratford	4 160	329·5	298	8,556·4	442·08
Mameera	Mrs. W. A. Wiggins, Stratford	4 306	344·1	343	8,601·0	386·16
Rewa Alyssum ..	A. Hazelton, Waihou	4 2	313·7	289	7,416·9	334·39
Mature.						
Lilium's Mab ..	H. B. Lepper, Lepperton	9 10	350·0	365	13,503·6	705·44
Lady Sweet's Holly..	G. Hodgson, Whakapara	7 84	350·0	365	10,092·05	624·38
Flora Deem ..	T. Pollock, Stratford..	5 327	350·0	365	12,320·0	524·67
Jersey Bank Lass ..	J. W. Beagley, Woodville	10 32	350·0	365	9,108·8	504·30
Apex Queen ..	T. Pollock, Stratford..	5 3	350·0	337	9,468·9	503·89
Mangere Belle ..	T. Pollock, Stratford..	6 64	350·0	300	10,394·6	484·95
Lady Rainbow's Gift	G. A. Berry, Manaia..	6 245	350·0	361	7,670·85	463·84
Lady Gertrude ..	T. Foreman, Alton ..	5 63	350·0	347	6,291·6	460·20

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS—*continued.*				
Mature—continued.		Yrs. dys.	lb.		lb.	lb.
Dignity ..	S. Atkinson, Papatoetoe	7 5	350·0	272	7,736·8	416·11
Royal Marie ..	S. Atkinson, Papatoetoe	8 176	350·0	322	7,336·1	356·95
Pansy Chase ..	R. K. Garland, Okauia	6 21	350·0	308	7,189·5	353·15
		FRIESIANS.				
Junior Two-year-old.						
Bywell Virginia Paxton	T. H. Richards, Cardiff	1 217	240·5	365	13,673·9	485·44
Posch de Kol of Oakview	W. Robertson, Willowbank	2 41	244·6	330	12,501·2	424·63
Nepean Countess Alcartra Pietje	J. J. Walker, Hawera	1 311	240·5	365	12,011·0	402·29
Poppyland Beauty of Fencourt	J. H. Jamieson, Cambridge	2 9	241·4	365	12,221·5	392·62
Oaklea Pietertje Fine	Knight and Sons, Ongarue	2 92	249·7	299	9,634·9	363·37
Brookdale Chief Pontiac	S. Clements, Hamilton	1 197	240·5	365	8,839·7	341·34
Canary Pontiac of Glen Lynne	S. Clements, Hamilton	1 250	240·5	296	9,194·3	323·62
Mangere Phyllis ..	Frank Ducker, Opotiki	1 294	240·5	344	8,978·8	321·00
Oaklea Dirk Soldene	Knight and Sons, Ongarue	1 262	240·5	298	6,991·3	319·62
Nepean Royal Colantha Pietertje	J. J. Walker, Hawera	2 55	246·0	282	8,704·0	312·46
Clover Pledge of Glen Lynne II	S. Clements, Hamilton	1 266	240·5	365	8,431·5	312·25
Waipuna Gipsy Jewel	A. Migounoff, Matakana	2 162	256·7	269	7,851·4	296·69
Senior Two-year-old.						
Pine Grove's Pride de Kol	E. J. Betts, Okaiawa ..	2 363	276·8	308	8,166·7	291·94
Junior Three-year-old.						
Ngatoro Fayne Segis	C. W. Baldwin and Son, Ngatoro	3 0	277·0	365	15,755·6	507·44
Senior Three-year-old.						
Westbrooke Gretchen	A. Migounoff, Matakana	3 357	312·7	318	15,302·5	490·38
Colantha Lass of Groteholm II	W. McLachlan, Leeston	3 364	313·5	311	14,027·2	451·04
Oaklea de Kol ..	Knight and Sons, Ongarue	3 351	312·1	257	9,534·4	332·77
Junior Four-year-old.						
Domino Heiress ..	Knight and Sons, Ongarue	4 31	316·6	337	12,709·7	500·19
Mature.						
Monavale Creamelle Regina	S. Clements, Hamilton	6 59	350·0	301	12,957·6	525·54
Glenlassie de Kol of Te Ngutu	S. Clements, Hamilton	5 234	350·0	335	16,400·7	505·65
Hikutaia Lass ..	Frank Ducker, Opotiki	5 268	350·0	365	14,681·9	479·49
Heiress Burke de Kol	A. Migounoff, Matakana	8 334	350·0	299	13,514·3	474·88
Princess of Poppyland	J. H. Jamieson, Cambridge	8 16	350·0	336	12,896·0	472·40
Colantha's Canary de Kol	Frank Ducker, Opotiki	7 186	350·0	346	11,488·0	383·22
Princess Patricia ..	Frank Ducker, Opotiki	8 31	350·0	365	11,402·1	382·62

SYLVIA OF O.K. (G. H. BELL, OAKURA).

C.O.R., 1921: 4 years 328 days; in 365 days, 11,926 lb. milk, 692·49 lb. butterfat.

HILDA MINTO DE KOL (C. H. STEADMAN, KAMO).

C.O.R., 1921: 10 years 116 days; in 365 days, 22,922 lb. milk, 738 lb. butterfat.

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days	Milk.	Fat.
			MILKING SHORTHORNS.			
		Yrs. dys.	lb.		lb.	lb.
Senior Four-year-old.						
Pansy II of Pukerimu	J. Fisher, Cambridge	4 296	343·1	365	10,963·1	418·04
Mature.						
Willowmere Cora ..	D. M. Holmes, jun., Pihama	..	350·0	308	11,076·3	401·95
Joyce III of Cornwall Park	R. S. Allan, Hatuma..	7 21	350·0	264	10,069·6	374·04
			AYRSHIRES.			
Two-year-old.						
Maesgwyn Starlight..	C. M. Williams, Ohaka	1 333	240·5	334	7,674·1	304·69
Three-year-old.						
Dominion Katrine ..	Moumahaki Experimental Farm, Waverley	3 73	284·3	339	6,954·5	346·45
Mature.						
Gladys of Ayrshire Moore	Litchfield Bros., Tirau	9 24	350·0	329	10,553·2	448·89

Second-class Certificates.

			JERSEYS.			
Four-year-old.						
Cymbeline ..	G. E. Cowling, Manaia	4 187	332·2	365	7,137·6	405·57
			FRIESIANS.			
Junior Four-year-old.						
Bainfield No. 11 ..	W. D. Hunt, Waikiwi	4 139	327·4	365	20,181·6	786·03
Bainfield No. 12 ..	W. D. Hunt, Waikiwi	4 41	317·6	354	12,234·3	516·78

The New Champion.—The Friesian cow Alcartra Clothilde Pietje, owned and tested by Mr. Vernon Marx, Mangatoki, Taranaki, and whose record in the making has been followed with much interest, completed her year under certificate-of-record test on the 15th of this month (October). Her yield stands at 31,312·5 lb. milk containing 1,145·24 lb. butterfat, and she commenced test at the age of 7 years 355 days. This splendid performance is a record for New Zealand in both milk and butterfat, and for all breeds. Alcartra Clothilde Pietje is expected to qualify for certificate by calving subsequent to test about 11th November. It is intended to give in next month's *Journal* a photograph of the new champion, together with some notes on her record and breeding.

Limestone Supplies.—There is no doubt that the cost of ground limestone in general is too high, and the remedy for this is the establishment of more works. The requirements of each district should be determined, with a knowledge of its limestone and power resources. There is room for much diversity of treatment when the differing factors—soil, power-supply, quality of stone, and weather of each district—are considered. It was largely in order to sort this evidence and decide and advise what is necessary in each case that the Lime Committee was called into existence. A large number of specimens of limestone and reputed limestone has been received for examination at the Department's Chemical Laboratory. It is satisfactory to learn that soft deposits of high-grade limestone continue to reward the searcher, and thus enable cheap sources of carbonate of lime for agricultural purposes to be utilized.—*Annual Report of Department of Agriculture, 1921–22.*

SEASONAL NOTES.

THE FARM.

FIELD-CROPS AND PASTURES: NORTH ISLAND.

GRASS should now be plentiful, and the matter of pasture-management will demand special attention. One of the greatest difficulties, particularly on cow country, is to control the growth and keep pastures in a succulent condition. Every endeavour should be made to have fields evenly grazed, as rough pasture is inferior for either milk-production or fattening.

Green Crops.—November is a good period for sowing rape and kale. Maize and millet may be sown early in the month in the northern and east coast districts, but on the west coast, except in very warm situations, the sowing is better deferred until the last week. Maize for green feeding may be sown at the rate of 2 bushels per acre, and a suitable manuring for average conditions is a mixture of half super and half blood-and-bone, at from 2 cwt. to 3 cwt. per acre. Hickory King is a proved variety of maize for green feed, while Ninety Day is good for both grain and green feeding. Many dairy-farmers do not favour maize on account of the expense of handling when feeding out; but where turnip feeding is not allowed by the dairy factory, or where this is known to be a risky crop, maize should have a place. It makes good silage, in which form it can be conserved for use when required. It is also quite a good crop for lamb-fattening, and for this purpose it is best fed just at the flowering stage.

Millet is a crop that is growing in favour, especially with dairy-farmers. Cattle and sheep like it, and dairy cows milk well on it. The crop can be fed off or cut and fed out. Under favourable conditions stock can be turned on to millet when 9 in. to 12 in. high, about ten weeks after it is sown. It is best fed off in breaks, and it comes away again after being eaten down. Japanese millet is to be recommended in preference to other varieties. From 15 lb. to 20 lb. will sow an acre if broadcasted, while about 15 lb. will do if drilled through every coulter. The same manure as for maize can be used, or superphosphate applied alone at the rate of 2 cwt. to 2½ cwt. per acre. If the crop is not required for grazing it may be left until the flowering stage and cut for hay or ensilage.

Sorghum requires less moisture than maize, and can be grown under drier soil and weather conditions. It is a warm-climate crop, best suited to North Auckland, and elsewhere should be grown only in fields which are well sheltered. Owing to toxic properties, this crop should not be fed to stock until it comes into flower, unless it is made into ensilage, in which case it is safe.

Rape is generally sown with the ordinary drill at the rate of 3 lb. seed per acre. Freezing-works manures, at 2 cwt. to 3 cwt. per acre, usually give satisfactory results, but in situations where the rape is inclined to grow tall better fattening-crops will be obtained by the use of basic super or mixtures of half super and half Nauru or Ephos phosphate. Experienced farmers will understand that a heavy leafy crop which is produced by an excess of nitrogen will not fatten like a firm but lighter crop grown with phosphates. The heavy leafy crop is all right for dairy cows, but generally for this purpose the genuine green Buda kale gives better results. Of the kales, both for lamb-fattening and cow-feeding, the Buda is the best. It can be sown at the same rate as rape, and the same manures used. Kale has an advantage over rape in that it gives a second feeding quicker, and is not so heating for dairy cows; on the other hand, rape is better for fattening lambs.

Further sowings of soft turnips may be made during November.

Cereals will now mostly have been sown and making good growth, but in late districts barley, particularly Black Skinless, may still be sown for a grain crop; also oats, of which Green's Ruakura will be preferable, as it comes to maturity very quickly. Either this oat or Black Skinless barley sown in November should be ready for harvesting in three months. Both may be sown at the rate of 3 bushels, with 1½ cwt. of superphosphate, per acre.

Intercultivation.—Crops sown in wide drills, such as mangolds, carrots, and early crops of maize, should be cultivated between the rows to keep down weed-growth and check the loss of moisture by keeping a loose mulch on the surface. Care should be taken to ensure that the surface is not made too fine. A tine cultivator will break up the soil, allow the finer material to drop below, and leave the surface somewhat cloddy. This will prevent the soil running together after rain and later setting hard. The good done by frequently stirring the soil between the rows cannot be overestimated, particularly in the warmer and drier districts.

Lucerne.—On most stands the first cut will be ready for removal in November, and is best either fed out to cows or made into ensilage, the weather at this time of the year usually not being favourable for haymaking. If removed at this period it should be ready for cutting again in six weeks. In some cases farmers will not be ready to cut in November, although their lucerne is ready, and in such cases it may be left without any danger of hurting the stand. The new growth will come up through it, and much of the earlier-growth leaves will fall. The subsequent cutting will contain a fair amount of stalk, but the stand will not be injured.

Land intended to be sown in lucerne this season should have frequent cultivation to germinate and destroy weeds. In dry, warm situations the seed may be sown early in November, but generally the first week in December is early enough. About 15 lb. of seed drilled through every coulter of the drill on a firm, well-prepared seed-bed will give best results. Inoculated soil, from 2 cwt. to 3 cwt. per acre, or one of the preparations such as Farmogerm, should be applied. If the land has been limed, manuring with superphosphate, at the rate of 2 cwt. to 3 cwt. per acre, is recommended. If no lime has been applied it is better to use basic super or basic slag at the same rate. The main essential in getting a good stand of lucerne is clean land and a well-prepared, firm seed-bed; while sowing should be deferred until warm weather is assured. Small areas of lucerne, up to a few acres, on dairy farms especially, are to be advised, where conditions favour its establishment. Farmers intending to sow an area and who are not familiar with lucerne-growing should seek further advice.

SOUTH ISLAND.

The sowing of cereals should now be finished, with the exception of barley, which can still be sown early in November. Linseed may be sown at the rate of 30 lb. to 35 lb. per acre, 1½ cwt. of super to be applied when drilling. Wheat land is the most suitable for this crop. In dairying districts suitable for maize the Hickory King or Red Hogan varieties may be sown for autumn green feed. Late potatoes should be got in, and such fodder crops as turnips, swedes, rape, kale, and chou moellier all come into November planting operations.

Spring-sown clover as a rule does better than autumn-sown, and it is advisable to get such pastures down as soon as possible. In most districts the rape crop is a very suitable one with which to sow down pasture in which cow-grass is the predominant seed used. Good clover stands can also be established by sowing together with the barley crop.

Turnip and Swede growing.—The sowing of turnips is one of the most important of farm operations during November, especially in Otago and Southland. It is essential that the land be in proper condition to ensure an even braird. The practice of ridging the turnips is so well established and gives such excellent results that this operation must be looked upon as essential to successful turnip-growing. Good results can only be obtained by having the paddock worked up into a nice fine tilth, and prior to sowing the land should be thoroughly

cultivated in order to eradicate the weeds which may be present. The quantity of seed to be sown may vary from 2 lb. to 4 lb. per acre, depending upon the germination, which should be high. On clay soils thick sowing is safer, and the seed should not be sown deeper than ½ in. The advantage of sowing thinly on good soils is the fact that less thinning is required, the plants therefore not receiving a check during this operation. Turnips cannot be grown successfully on soils deficient in phosphates unless resort is made to manuring. As rapid growth is very desirable in the young stage of the plant's life, superphosphate should be sown in the drills with the seed at the rate of 3 cwt. per acre. Where the land is inclined to be sour, or where previous liming has not been carried out, basic superphosphate or basic slag should be used. These fertilizers, however, only contain phosphate, and the best results in turnip-growing are obtained when a mixture containing phosphate, nitrogen, and potash is used. This can be well supplied to the crop by mixing 3 cwt. super, 1 cwt. kainit, and 1 cwt. dried blood. This should be applied at the rate of 5 cwt. per acre.

Swedes grow much more slowly than soft turnips, and require usually one or two months more than the latter to reach maturity. They are hardier and keep better, and also contain a higher percentage of solids. They should accordingly be sown with a view to providing later feed. The best land should be reserved for the swede crop, as they require better soil than soft turnips. The two varieties which have given best results in recent test work are Superlative and New Empire.

Of the two classes of soft turnips—whites and yellows—speaking generally, the white varieties are most suitable for feeding in the early autumn, the yellows in later autumn and midwinter. In experiments carried out by the Department at Gore the keeping-qualities of the varieties tested showed in the following order of merit: (1) Deep Golden Yellow Long-keeping, (2) Purple-top Scotch, (3) Green-top Scotch, (4) Hardy Green Globe, (5) Mammoth Purple-top, (6) Lincoln Red Globe. The results obtained from this test clearly indicated that Lincoln Red, Mammoth Purple-top, and to a certain extent Hardy Green Globe should all be grown for early feeding. Sown early enough to allow of their coming in for late summer or early winter feed they would be very profitable, but to hold over for late feeding they are quite useless when compared with the other varieties of the test.

Lucerne.—In Canterbury spring-sown lucerne has much to recommend it, and the seed can be got in during November provided the land is thoroughly clean. If there is any doubt about the cleanliness of the land it is better to wait till the early autumn. The lucerne should be sown with 2 cwt. of super per acre, and this is particularly the case when proper cleaning of the ground delays sowing until the early autumn.

In Central Otago, where irrigation is practised, it is desirable to give the land a thorough irrigation prior to sowing. When the ground is dry enough to permit of harrowing this should be carried out as soon as possible. The seed should then be sown with the drill, at the rate of 12 lb. per acre, care being taken not to sow too deeply. When sown broadcast the seed should be lightly covered with a brush harrow or a harrow made of wire netting. A light rolling can then be given to ensure the soil being firmed round the seed. In no circumstances should watering be resorted to until the young plants are well through the ground, otherwise a bad check will result. Where irrigation is not resorted to the land must be sufficiently moist to ensure a good strike and also promote subsequent growth in the young plant. When inoculation has to be carried out—and this is seldom the case in Central Otago—it can be best effected by obtaining surface soil from a well-established lucerne stand, and broadcasting it on a dull day over the paddock intended to be sown in lucerne, prior to seeding, at the rate of 2 cwt. per acre. Either Marlborough or Hunter River variety of seed is recommended. Grimm lucerne has shown no superiority over the two former varieties.

THE ORCHARD.

EARLY in November most orchard-trees will be ready for another of that series of fungicide sprays which is essential to most kinds and varieties of fruit-trees at this season of the year. The principle underlying our campaign against orchard fungi and many insects is that of prevention. That is why, during the danger period of early spring, the trees are kept coated with a spray that will make it difficult for fungus spores or grubs to survive in or enter the tissues. To the fungicide it is now usual to add the arsenate-of-lead insecticide for pip-fruit trees, thus securing the dual protection referred to above. There seems to be a keen debate in some quarters as to the need for this addition at the present season, it being contended on the score of economy that the action might be deferred. If codlin-moth were the only insect pest to be dealt with just now there might be something in the argument, but, considering the danger from leaf-roller and "brown" beetles of sorts, the economy—considering the principle under which our sprays are applied—is probably a false one.

As the apple and pear trees set their fruit they should receive an application of lime-sulphur, 1–80 or 1–100, to which the arsenate of lead, after careful preparation, may be added. In the case of varieties of apples or pears specially subject to black-spot fungus bordeaux may be used, but owing to its russeting effect it should at this season be used on apples only in specially difficult cases.

At the same stage of growth stone-fruit trees should be sprayed with lime-sulphur, 1–120, as a protection against the attack of brown-rot fungus. This will not be effectual, however, unless at short intervals during the summer—say, once a week—the trees are gone over and affected fruit and twigs removed and destroyed. Owing to the delicate nature of the foliage, arsenate of lead, should it be needed, had better be put on separately.

On bearing trees thin the fruit as soon as the danger of falling is past. There is nothing to gain by letting a tree break down through overcropping. It is best to pick the fruit from young trees in commercial orchards, as to spray it is not worth while, while if it is left on the trees it harbours pests, and, worse still, prevents the young trees making maximum growth. Young trees of all kinds are benefited by a little extra supervision. Once or twice during the growing-period look over them and pinch out the point of shoots which are badly placed or making excessive growth. Trees recently grafted require somewhat similar attention, but if the stock is large it is well not to repress the growth very much during the first season. If the wounds from severed limbs have not been tarred, painted, or waxed, do this without delay, as the danger of infection is a very real one. From time to time see that the ties and waxing are secure.

The matter of cultivation should be given a good deal of consideration; as the crop gets heavier and the branches spread the operation becomes more difficult, and sometimes impossible. The necessary implements will vary with the class of soil; often a shallow cross-ploughing is good treatment at this period. In any case maintain an even surface with a tilth of moderate depth, doing what is possible to suppress bad weeds.

The growth and blossoming of citrus-trees, especially lemons, have been very irregular this year, and growers must judge individual cases and put on the application of bordeaux at 5–4–40 when the spring growth has hardened, or at 4–4–40 if the fruit has set before the growth hardens off. The heavy frosts experienced during the past winter have caused much damage to citrus-trees, more especially lemons, where no covering was afforded. Attention should be paid to all affected trees, and all frosted parts cut away to a bud or lateral growth. This work is important, as dead wood resulting from neglect to carry it out will afford abundant opportunity for the entry of borer. It is not yet too late to apply nitrogenous and phosphatic manures, but they should be got on without further delay.

Fireblight will now be making itself evident in those districts affected, and all growers are urgently requested to keep a sharp watch on their pip-fruit trees. As soon as any suspicious symptoms appear remove the affected part immediately and destroy by burning, always remembering to cut well below the infection. Growers must not allow themselves to be lulled into a sense of false security because there was no infection in their own particular orchard last season. They should exercise unceasing watchfulness, and will thus be helping the Department in its efforts to stamp out the disease.

—*Orchards Branch of the Horticulture Division.*

POULTRY-KEEPING.

WHERE heavy-producing stock is the object aimed at, the end of October should see the full complement of chickens hatched out for the season. Chickens brought out later will in most cases prove disappointing. Nevertheless, in many cases where poultry are kept in small numbers and where broody hens were not previously available, hatching operations will probably be continued for some time yet, as in the circumstances it means late-hatched chickens or none at all. Where the majority of the adult stock kept are old and have probably passed their best period of usefulness, the question of hatching out some chickens during next month is worthy of consideration. It is true that the late-hatched chicken is always more or less undesirable as compared with the early-hatched bird, but the late-hatched pullet, if given proper care and attention, can be depended upon to return a better profit than could an old worn-out hen.

Where hatching has been delayed till this late season, the necessity for doing the young ones well from first to last, in order that they shall not be subjected to any check in development, cannot be too strongly urged. The first thing necessary is to see that they are not tortured with insect pests. If these are to be kept at bay the quarters must be maintained in a thoroughly clean state, while the mother hen should be given an occasional dusting with insect-powder. See that the powder reaches the skin. Do not dust the hen just before the chicks hatch or when they are very young, as the powder may get into their eyes and cause blindness. From the first give good wholesome food, and if the chickens are to make the best growth the greater proportion of this should be provided in a moist form; this applies to the early-hatched birds as well as the late ones. It must be always remembered that too much hard dry food tends towards retarding rather than advancing growth. Even where a prepared commercial food is being used the chickens will do better if this is moistened with milk or hot water and left to swell before being fed. Probably there is no better food for promoting healthy development in the growing chicken than a good grade of hulled oats, but even with these, except perhaps for the evening meal, better results will be obtained by feeding in a moist condition. Do not forget to provide an ample supply of green-stuff, such as finely chaffed succulent grass, clover, lucerne, water-cress, &c. Another important matter is to provide plenty of shade, and wherever possible place the young ones on a piece of clean fresh ground. The late-hatched chicken is always at a decided disadvantage as compared with the early-hatched bird, and this involves the necessity of giving it the best possible care and attention during all stages of its development.

A HEART TROUBLE IN HENS.

Many complaints have reached me of late regarding hens in full-laying condition suddenly dropping dead from no apparent cause. In almost every case where opportunity has been afforded me of making a post-mortem examination the heart was found to be in a badly ruptured and enlarged condition. In some birds the gizzard was found to be packed with fibrous matter such as oat-husks, grass, &c., and little or no grit. In other cases the gizzards were normal and contained a fair amount of grit, but when opening up the digestive tract intestinal parasites were found in large numbers. Thus it would appear that the heart,

owing to the digestive system becoming deranged by gizzard-compaction or the presence of round worms, became weak, and the excitement engendered by the birds rushing for their food caused heart-rupture and consequent death without the slightest warning.

It therefore seems that the only way of preventing this trouble is, first, to keep birds well supplied with sharp gravel grit in order to assist digestion by grinding up any fibrous matter that may become lodged in the gizzard. The next important matter is to make sure that the birds are not suffering from intestinal parasites. A common indication of worms is that the birds stretch their necks and make a sort of screeching noise both by day and by night. Another symptom is that they may be noticed to yawn frequently. Where fowls are affected with worms these will be readily found by opening and following the digestive tract with a small penknife. Where these are found the whole of the flock should be given a dose of Epsom salts, about a 1 oz. packet for every twelve birds, dissolved in the water with which the mash is to be mixed. Add also to the mash some sulphur (about the same quantity as of salts), and a teaspoonful of pure spirit of turpentine for every five birds, the whole to be thoroughly mixed with the mash ingredients before they are moistened. The birds should be starved for nearly a day before the mixture is supplied to them. The treatment may be repeated in a week's time.

Worms, like most other troubles which affect poultry, can only be successfully dealt with by preventive methods, and the first thing necessary in this connection is never to allow the runs to get into a poultry-sick tainted condition. The best remedy for tainted soil is to turn it over and sow it down, while a good sprinkling of quicklime will not only help considerably to sweeten the soil but will also encourage plant-growth. Stale ground is the weak link in the chain of management on many unsuccessful plants.

Referring again to grit, some people merely supply their fowls with more or less decayed broken sea-shells collected from the seashore. This is a mistake, for while such will usually act as an egg-shell-forming material, they are nevertheless next to useless for assisting a bird to digest its food and for the prevention of gizzard-compaction. For the manufacture of egg-shells the heavy layer must be provided with lime in some form or other, but for this purpose freshly broken oyster-shell, &c., is always preferable to shell in a bleached decaying condition. But even where the former is available to the birds sharp gravel grit should be provided as well. The latter acts as teeth to a bird, and where deprived of it digestive and other troubles are apt to follow as a consequence.

DUCKS.

While the correct season for hatching chickens has now passed, there is still time enough for hatching out ducklings for the production of future laying-stock. Ducklings are much easier to rear than chickens, and can be weaned from the brooder or mother hen at a much earlier age. One of the chief secrets in rearing ducklings at this period of the year is to provide them with plenty of fresh air. Even where they are being reared with the mother hen the coop should be arranged in such a way that plenty of fresh air is available to them at all times. Young ducks are very prone to sunstroke, and unless good shade is available to them the mortality will be great. When a duckling becomes affected with sunstroke it will be observed to fall on its back, with the eyes twitching, and generally presenting a distressed condition.

Ducklings which have had a long fast and are then given food and water will often behave in a similar manner, and with heavy mortality. Especially is this so where artificial methods are being adopted. The only safe way of preventing trouble in this connection is to have water within reach of the birds at all times, both by day and by night, especially during the first few weeks. Do not compel ducklings to sleep on damp or wet bedding, as this is a common cause of leg-weakness. The drinking-vessels should be placed well away from the sleeping-compartment, as this will lessen the risk of the bedding-material becoming wet. See that the drinking-vessels are sufficiently deep to enable the ducklings to give their nostrils a good blow-out, for if these are allowed to clog, the eyes become plastered, and troubles such as loss of power in the back and legs soon follow.

—F. C. Brown, Chief Poultry Instructor.

THE APIARY.

FOOD-SUPPLY.

In districts devoid of native bush, where the bees are practically dependent on the flora found in the open paddock, it will be necessary to keep an eye on the food-supply during November. Willows, dandelion, and fruit-trees will have ceased to bloom, and while there will be a little clover in flower this is not likely to secrete nectar. Clover is very susceptible to climatic conditions, and the right conditions for its secretion of nectar do not usually prevail until the end of November or early in December. Hawkweed and capeweed will then be in full bloom, so in districts favoured with abundance of this flora there should be a good flow about the time stated. In the meantime care should be taken that the bees are not allowed to starve—it is a critical stage in the life of the colony.

SWARMING.

Given reasonably fine weather some colonies will have become very strong and, unless steps have been taken to prevent it, overcrowded and inclined to swarm. It is best to keep down swarming as much as possible, and to make any increase desired in anticipation of the natural tendency. If no increase is desired, the simplest way to keep down swarming is to provide the bees with plenty of room and offer them inducement to avail themselves of it. This is best accomplished by giving them a super containing, for preference, nine combs—assuming that it is a ten-frame hive we are dealing with—the centre comb being a frame of brood lifted from the brood-chamber and replaced by an empty comb. It is not sufficient to merely place the super of empty combs over the brood-chamber; the frame of brood must be lifted and placed in its centre. Where half-depth supers are used this is not practicable; in such cases it is advisable to make a practice of carrying over some partially filled combs from year to year. Even when it is intended to produce section honey it is best to draw the bees first into a super of ordinary combs. When the bees have become accustomed to working in the super it can be removed and a rack of sections substituted.

Despite every precaution, however, the bees will sometimes swarm. It will not be a very serious set-back to the apiary if a few colonies do each cast one swarm, but after-swarms must be prevented as far as possible. The first swarm will be headed by the old queen, and will, given fine weather, come off as soon as the first queen-cell is sealed. Swarms, especially those headed by a laying queen, almost invariably settle within a few minutes close to the apiary. It is not safe to reckon on the bees remaining long at their first resting-place, however, especially if this is a sunny situation; they may rise again within ten minutes and fly for miles before again settling.

To take the swarm procure a benzine-case or similar box and hold under. If the bees have settled on the branch of a tree shake them with a vigorous jerk of the branch into the box; when this is not practicable brush them in. Then as quickly as possible slip a bag over the box and turn it upside down, placing a stick or stone under one corner to provide an opening for the bees. Leave the bees in this box until at least 4 o'clock in the afternoon, then take them to the site of the prepared hive and, after placing a sack on the ground, shake out the bees immediately in front of the hive. In dealing with a swarm at an out-apiary where it is desirable to hive it at once it is a good practice to place in the centre of the hive a frame of open brood taken from an established colony. This will prevent the bees absconding. The greatest care, however, must be exercised to ensure that disease is not thus transmitted. In hiving a swarm under such conditions place an empty super on top of the prepared hive, take the swarm in a bucket, and then shake the bees into the super. The frame of brood in the hive below generally attracts the bulk of the bees downwards; the balance can then be brushed from the sides of the super, the super taken off, and the swarm taken in a few minutes to its permanent location in the apiary.

To check any further swarming look over every frame carefully and cut out all but one queen-cell. It is necessary to handle the frames as gently as possible; do not shake the bees off the combs lest the one remaining queen-cell is destroyed. There is a possibility that the bees may swarm out with the young queen when she takes her maiden flight. If this does happen put them back again without fail.

GENERAL.

The hives should be rested on bricks or stands of some description, raising them about 6 in. off the ground. Place the bottom-board with a slight slope toward the front. Keep down the grass and weeds about the hive; a tangled entrance which hinders the exit and entry of the bees seriously affects the honey crop. If gable roofs are used, do not fail to use mats to prevent the bees building in the roof. Mats are not necessary with flat roofs.

—*H. W. Gilling, Apiary Instructor.*

THE GARDEN.

VEGETABLE-CULTURE.

In the warmer districts tomato-plants will be now well advanced in growth. Spraying should not be neglected. A bluestone solution should be used, this being more effectual and safer than lime-sulphur. Washing-soda may be used in place of lime; this is customary in some of the largest and most successful plantations. The formula for lime bordeaux is 4–4–40—that is, 4 lb. bluestone, 4 lb. lime, and 40 gallons water. When soda is used a little more than 1¼ lb. should take the place of each 1 lb. of lime. In later districts planting will now be general. The fertilizer employed should not contain too much nitrogen, and a small amount of potash should always be used.

The main crops of parsnips, carrots, and red beet should now be sown. A good seed-bed is now easily secured, and slugs and snails should not now give trouble, therefore thin sowing is safe If this is carefully done there should be no gaps, and a great amount of labour in thinning will be saved. In the colder districts savoys, cabbages, broccoli, and brussels sprouts for winter use will have been sown. In middle districts the third week in November is early enough, except in some few places where very cold winters are experienced, and where the seasons approximate closely to those in the extreme south the practice should be the same as in those places.

Peas should be sown twice each month, the crop having a currency of about a fortnight. French and butter beans crop longer than do peas. A sowing every third week is sufficient to maintain a supply. Turnips should be sown in small lots, as they deteriorate very quickly during the summer months. Those of the Snowball type are best; they come to first use about seven weeks from sowing. The rule should be to sow another plot when those from the previous sowing are first pulled. Lettuces should now be sown thinly in drills, and the surplus thinned so as to avoid transplanting.

Late-sown crops of onions should be thinned as soon as possible, as growth is more rapid when the competition of the surplus plants is removed. Weeds should be rigidly repressed, as they rob the soil of moisture. If growth is not satisfactory give a dressing of nitrate of soda, ½ oz. per square yard (equal to approximately 1½ cwt. per acre). When thinning, the plants need not be left in single lines; leave them standing 3 in. to 4 in. apart. Moderate-sized bulbs, four or five to the pound, are most useful and command the best price on the market. Pickling-onions are obtained by sowing Silverskin variety broadcast on a plot of poor soil at about the middle of November. The seeds should, as far as can be managed, be carefully scattered so as to fall separately but fairly close together. No thinning should be done.

The rule is to cease cutting asparagus when peas come in. Next season's crop of asparagus depends on a large number of heads standing to mature. If growth is not as good as it should be give a dressing of blood-and-bone, 2 oz. per square yard, and 1 oz. of nitrate of soda; or in place of blood-and-bone a thorough soaking with liquid manure made of horse, cow, or sheep manure. Nitrate of soda should not be omitted. On young beds it is important that all growths be preserved. In windy places it may be necessary to support the growths by driving in a few strong stakes and running binder-twine along each side of the rows. When the growths are about 2 ft. high the tops may be cut off. This will dwarf them and cause them to branch more; the intermingling of branches forms a mutual support, and in some cases saves staking.

—*W. H. Taylor, Horticulturist.*

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

SOFT TURNIPS AND MILK-TAINTING.

R. H. RODNEY, Leigh :—

Would you kindly advise me of the best method of feeding off soft turnips to dairy cows without tainting the milk? I am given to understand that it is the leaves that taint the milk. In that case would it be advisable to turn other stock on first to eat off the tops before allowing the dairy cows access?

The Live-stock Division :—

There is no method whereby soft turnips can be fed to dairy cows without somewhat tainting the milk. The taint, however, can be minimized by the method adopted in feeding. If the cows are allowed to have a liberal supply of hay before being turned on the turnips, and then only allowed to feed on the turnips for about an hour shortly after each milking, it will be found that the turnip flavour is considerably decreased. The roots, as well as the leaves, taint the milk.

TALL FESCUE AND THE LOTUSES IN SOUTH CANTERBURY.

A. L. O., Hazelburn, Timaru :—

Would you kindly tell me if tall fescue would grow successfully in South Canterbury, also which of the *Lotus* family (*corniculatus* or *angustissimus*) is most suited for dry soils in South Canterbury?

The Agricultural Instruction Service :—

Tall fescue will grow very rank in damp situations in South Canterbury. Under such conditions it is a coarse, undesirable feed, and through ergot may be very detrimental to the feet of stock. It is being experimented with in dry situations at the present time. The indications to date are that it will grow there successfully with little danger of becoming too coarse. The *Lotus* family does not appear to be well suited to the dry soils of South Canterbury. *Lotus corniculatus* would be the more likely one to succeed, but neither can be recommended.

COWS PLAGUED WITH FLIES.

"AMATEUR," Epsom, Auckland :—

I have a couple of Jersey cows which as warm weather comes are plagued with flies. These settle on the fore legs and cause such irritation that the cows, by constant licking and biting the legs, cause the skin to break and remain broken all the summer. I have tried kerosene, Stockholm tar, and grease, but all are unavailing, the poor beasts licking or rubbing them off. Can you suggest a remedy?

The Live-stock Division :—

The trouble described frequently occurs in small paddocks in the suburbs of Auckland, more especially where the paddocks are well sheltered. The sores are started by the flies settling on the fore legs just behind the knees, where the skin is thin. They cause irritation, the part becomes swollen, and cracks are formed owing to the movement of the knees. At this stage the animal commences to lick the sores, and ultimately an open sore is left, which is more difficult to heal. In these cases kerosene and Stockholm tar—especially the latter—are far too irritant as a dressing, and should not be applied. A good remedy is to dust the

parts with a mixture of 1 oz. boracic acid and 1 dram iodoform. The animal's legs should then be encased in a pair of old stockings attached above to a light sack rug. This serves a dual purpose, as it prevents the animal from licking and irritating the sores, and the flies from settling. In fact, if the stockings are put on before the fly season commences it will obviate the trouble altogether.

ERADICATING HEMLOCK.

G. V. WADDY, Edgecombe, Kekerangu :—

I have one or two bad patches of hemlock which I want to clear, and should be glad to know the best and the quickest method of dealing with this weed. Does grubbing the tops off kill it ?

The Live-stock Division (Noxious Weeds Inspection) :—

The best method of eradicating hemlock is to hoe or grub it out by the roots, cutting it well below the surface of the ground. Cutting the tops off is a most unsatisfactory method of dealing with it, as the plant, being a biennial, would most probably grow again from the root.

SOWING INOCULATED SOIL WITH MANURE.

F. J. E., Bull's :—

In sowing lucerne-seed would it be injurious to the bacteria of inoculated soil if this were sown mixed with manure ?

The Agricultural Instruction Service :—

Inoculated soil and manure may be sown together either by hand or through the drill, but they should be mixed just prior to sowing.

MILKING A COW BEFORE CALVING.

"ARMON," Matapu :—

Does milking a cow before calving prolong calving, reduce the danger of the animal developing milk-fever, or harm her in any way for the season ?

The Live-stock Division :—

Milking a cow before calving should have no ill effect on the act of calving, nor should it in any way harm the season's milking. Many cows do not go dry, but keep on milking, from one calving to another. Milking before calving should have little effect on reducing the danger of milk-fever.

GROWING OF ARTICHOKES.

"SAFETY CAMP," Puniwhakau :—

We are thinking of growing artichokes for pigs, and would like information on the following points : Is it necessary to plough the land, or can artichokes be planted without ploughing if the ground is too rough to plough ; what is the best way, the distance apart, and time to plant ; and what manure is necessary ?

The Agricultural Instruction Service :—

The preparation of land for growing artichokes is similar to that for potatoes, and a good seed-bed is essential. To attempt planting on rough land without ploughing would be a waste of time. Artichokes should be planted in August or the early part of September ; it is difficult to keep the tubers sound enough for planting after September. Plant in rows 3 ft. apart and 2 ft. apart in the rows ; about 8 cwt. of seed per acre is required. For manure use special potato-manure or superphosphate at the rate of 4 cwt. per acre. Several growers in the Waikato have been advertising seed for sale.

REVIEW.

THE NATURALIZATION OF ANIMALS AND PLANTS IN NEW ZEALAND, by HON. G. M. THOMSON, M.L.C., F.L.S., F.N.Z.INST. Cambridge University Press. 1922. 607 pp., 1 map.*

In economic value and general calibre this volume by Mr. G. M. Thomson will stand high among works of New Zealand authorship. A glance through its pages suffices to show the author's very intimate acquaintance with the past and present biological history of this country, and it is fortunate indeed that through his foresight and labour we now have before us information of fundamental value which otherwise would have been irrevocably lost.

The records given in the opening chapters of the deliberate introduction of mammals and birds clearly demonstrate that it was an evil day for New Zealand when acclimatization societies and private individuals, unrestricted, and "with zeal unfettered by scientific knowledge," set to work to stock this country with game, much of which now ranks among our greatest pests and nuisances. And what applies to animals is equally true of many of the plants. Of the many examples under both categories may be cited the introduction of the rabbit, ferret, deer, Californian quail, sparrow, yellowhammer, blackberry, and gorse. To quote Mr. Thomson (after giving several cases in point): "The whole history of acclimatization efforts in New Zealand abounds in similar bungles and blunders, and while a certain measure of good has been achieved—notably in stocking our nearly empty rivers and lakes with fine food and sport fishes—yet the record of harm done is enormously greater. So-called acclimatization societies to-day are only angling and sporting clubs. At any rate, the public wants education on the question, and this work is a contribution towards that aspect of it."

Surveying the volume, Chapter III contains records of the introduction of some forty-eight mammals, of which twenty-five have become acclimatized. Only six of the latter are useful to man, the remainder being injurious in one way or another, some decidedly so. About 130 species of exotic birds (Chapter IV) have reached our shores, either naturally or through the agency of man, but only some twenty-four species have established themselves, many of which, again, are detrimental to the agriculturist. Chapter IV gives a detailed account of the acclimatization of fish in New Zealand waters, and shows that about one-third of the species have become successfully established. In this important work the Portobello Marine Fish-hatchery, under the direction of Mr. Thomson and the curator (the late Mr. Anderton), played a leading part. A considerable part of the work (Chapter VIII) deals with over three hundred species of insects, most of which have been accidentally introduced, many being among our most serious pests. The good work done by the introduction of many beneficial insects is also described. Part III deals with the introduced plants, of which, says the author, over six hundred species have become more or less truly wild. It is shown that, although a number have been established for agricultural purposes, most have been accidentally introduced.

In Part IV there are important chapters on the interaction of endemic and introduced faunas, and the alteration in the flora since European occupation, which throw considerable light upon the changes which have taken place in the country. "The introduction of foreign plants into New Zealand has wrought a very radical change in the facies of the vegetation. The distinctive character of the native flora has disappeared from nearly all closely settled portions of the country, and what may be called a cosmopolitan type of vegetation has taken the room formerly occupied by the displaced species." This applies equally well to the animals, as illustrated by the destruction of native birds by weasels. The concluding chapter gives an account of New Zealand legislation dealing with various introduced pests.

The book is one which farmers and others interested in animal and plant life in New Zealand should possess or have access to. In particular it may well be recommended to our acclimatization societies for close study.

D. M.

* Stocked in New Zealand by Whitcombe and Tombs, Ltd., 52s. 6d.

WEATHER RECORDS.

SEPTEMBER, 1922.

THE following general summary and rainfall statistics are supplied to the *Journal* by the Director of the Dominion Meteorological Office (Mr. D. C. Bates):—

Judging from early reports, rainfall has been below the average for the month of September, except in the far North, where it was above. The heavy rains that occurred there at the end of the month were accounted for by a succession of disturbances on the edge of the anti-cyclone which at that time overspread the Dominion. The most general disturbance of weather conditions occurred between the 9th and 14th. On the 9th atmospheric pressure was decreasing steadily, with northerly breezes and mild and hazy conditions, and the rain which followed in most parts on the 10th and 11th was very welcome. Some snow was reported on the 11th on higher levels in the South, and on the 13th snow was reported at higher levels in the North Island as far north as the Gisborne district. This disturbance seems, however, to have been of wide extension and mild cyclonic nature, the centre passing through Cook Strait on the afternoon of the 11th. The southerly winds in the rear were stronger than the northerlies in the front, but considering the rapid rise of the barometer they were neither so strong, squally, or cold as might have been expected. Changeable and showery spring weather was experienced at other times, but atmospheric pressure was mostly above normal, and there were several sharp frosts at night in many parts of the Dominion. The month was a good one on the whole for agricultural work, the ground being fairly dry, while at the same time there was sufficient growth for stock.

RAINFALL FOR SEPTEMBER, 1922.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	8·44	12	4·86	4·75
Russell	8·70	18	2·10	3·42
Auckland	3·02	12	0·99	3·63
Tairua, Thames	4·75	11	2·05	4·64
Tauranga	1·74	8	0·50	4·33
Kawhia	2·03	12	0·42	4·39
Maraehako Station, Opotiki ..	2·44	7	1·16	4·28
Hamilton	3·34	6	1·04	4·37
Taupo	2·24	5	0·74	3·71
Gisborne	2·15	16	0·40	3·11
New Plymouth	4·58	15	1·34	5·08
Whangamomona	2·26	7	1·22	7·57
Taihape	1·52	14	0·42	3·72
Napier	1·30	15	0·42	2·29
Patea	3·42	8	1·44	3·63
Wanganui	1·67	6	0·55	3·05
Masterton	2·52	12	0·92	3·18
Foxton	2·21	8	0·60	2·38
Wellington	2·52	11	0·62	4·10
South Island.				
Collingwood	6·22	13	1·86	10·13
Nelson	3·60	9	1·48	3·75
Spring Creek, Blenheim	4·80	7	1·76	2·64
Westport	2·84	11	0·98	6·82
Tophouse	1·93	8	0·76	4·81
Greymouth	4·29	9	1·68	8·26

RAINFALL FOR SEPTEMBER—*continued.*

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
South Island—continued.				
	Inches.		Inches.	Inches.
Hokitika	5·03	14	1·28	9·23
Gore Bay	5·54	9	1·96	4·28
Arthur's Pass	2·90	6	0·68	14·96
Christchurch	2·53	9	0·46	1·75
Lambrook Station, Fairlie ..	1·57	5	0·62	2·30
Okuru, Westland	6·86	12	1·96	12·48
Timaru	1·04	7	0·56	2·18
Oamaru	0·65	9	0·35	1·74
Benmore Station, Omarama ..	0·91	4	0·44	2·14
Queenstown	0·56	5	0·20	2·52
Clyde	0·91	8	0·30	1·06
Dunedin	1·88	15	0·36	2·75
Invercargill	2·20	15	0·46	3·03

REVENUE OF THE DEPARTMENT OF AGRICULTURE.

THE revenue of the Department for the financial year 1921-22 was as follows:—Sales of stock and produce from experimental farms and areas, also horticultural and poultry stations, £27,461; quarantine sustenance fees for imported live-stock, £1,198; sales of poison for destruction of rabbits, £10,648; destruction of rabbits on Crown and private lands, £1,888; fees for semi-official testing of purebred dairy cows and cow-testing associations, £5,813; services of Farm Dairy Instructors, £3,192; dairy-produce-grading fees, £12,863; sales of *Journal of Agriculture* and photographic material, £2,212; fees for testing seeds, £605; fees for fumigation and destruction of diseased fruit, £196; meat-inspection fees, £26,222; dairy registration fees, £2,890; nursery registration fees, £533; brand registration and other fees, £4,580; miscellaneous, £10,133: total, £110,434. NOTE.—The amount shown for sales from experimental farms, &c., does not include wool, neither the 1921 clip (nor that of 1920) produced on the farms having been marketed during the financial year.

Weraroa Sale of Pedigree Cattle and Pigs.—The Central Development Farm held its annual sale of pedigree cattle and pigs on 12th October, the fixture attracting buyers from both the North and South Islands. Seventeen lots of Friesian bulls averaged 36¾ guineas, the highest price, 90 guineas, being paid for Dominion Woodcrest King Segis of Rock, a three-year-old animal. Red Poll bulls (seven lots sold) realized an average of 28½ guineas, the top price being for Dominion Egmont, at 40 guineas. Red Poll females (eight lots) averaged 30¼ guineas, Orange bringing the highest figure, at 47 guineas. One Guernsey bull calf brought 11 guineas. The offerings of Berkshire boars and sows were well competed for and all sold at prices ranging from 5 guineas for weaners to 11½ guineas for sows in pig. The high quality of the pigs was freely commented on.

The Purchases of the Department of Imperial Government Supplies since 1915 have comprised the following aggregates: 3,671,885 quarters beef, 17,447,046 carcases mutton, 17,681,218 carcases lamb, 370,469 60 lb. freight carcases other meats, 3,148,510 boxes butter, 3,137,765 crates cheese, 2,348,143 bales wool, 7,666,864 sheep-skins, 370,507 hides and calf-skins, 774 tons scheelite, also considerable quantities of frozen and canned rabbits, canned meats, and milk products other than butter and cheese. The total sum disbursed by the Department for these goods was £160,604,710. The administration costs of the business amounted to only 0·059 per cent., or 14¼d. for each £100 of business done.

STANDARDIZED GRADE-MARKS FOR FROZEN MEAT.

In furtherance of its efforts to reduce the present multiplicity of marks the New Zealand Meat-producers Board has for some time been in consultation with freezing companies in regard to standardizing the grade-marks placed on frozen meat, and the following schedule has been agreed upon for use on all frozen meat treated for export in the ensuing season :—

Mutton.

Prime wethers and maiden ewes : 48 lb. and under, **1** ; 49–56 lb., **7** ; 57–64 lb., **3** ; 65–72 lb., **9** ; 73–80 lb., **5** ; 81 lb. and over, **0.**

Second-quality wethers and maiden ewes : **X.**

Ewes : 48 lb. and under, **1E** ; 49–56 lb., **7E** ; 57–64 lb., **3E** ; 65–72 lb., **9E** ; 73–80 lb., **5E** ; 81 lb. and over, **0E.**

Second-quality ewes, all weights : **XE.**

Lamb.

Prime lamb : 28 lb. and under, **D** (optional) ; 29–36 lb., **2** ; 37–42 lb., **8** ; 43–50 lb., **4** ; 51 lb. and over, **T.**

Second-quality lambs : **Y.**

Beef.

Prime ox beef, 160 lb. and under, **1** ; 161–180 lb., **2** ; 181–200 lb., **3** ; 201 lb. and over, **4.**

Second-quality ox beef : **X.** Prime heifer beef : **H.** Cow beef : **C.** Second-quality cow beef : **CX.**

Veal.

Prime veal, all weights : **V.** Second quality veal : **VX.**

Notes.

Second-quality heifer beef is to go along with cow beef.

The grade "28 lb. and under" in lambs is optional, and may, if desired, be included in the grade "36 lb. and under" with the grade-mark **2.**

Second-quality wethers and maiden ewes may be graded according to weights —namely, 56 lb. and under, **X1** ; 57 lb. and over, **X2.**

Second-quality lambs may be graded according to weights—namely, 36 lb. and under, **Y1** ; 37 lb. and over, **Y2.**

Where freezing-works do not desire to separate the weights of any particular description of meat they may at their option group these weights.

The Board has no desire to interfere with existing head-brands, as it fully recognizes the value of the present existing ones, which are well known in the trade. It believes, however, that the trade would be better served generally if all freezing-works avoided introducing new head-marks, except where necessary in opening new markets.

MINIMUM-SIZED SHIPPING PARCELS.

The Board has also decided that for all meat killed after 1st October, 1922, the minimum number of carcases of sheep or lambs which may be shipped in one parcel shall be 300. Such parcels may contain more than one grade-mark, but as lots of less than 100 sheep and/or lambs are subject to 33⅓ per cent. additional storage charges in London, it is recommended that small lots should be pooled whenever possible. The Board may later increase the minimum parcel to 500 carcases if after experience it is found advisable.

The Beekeeping Industry continues to make steady progress in the Dominion. The number of registered apiaries at the close of last financial year was 7,386, representing a total of 96,051 hives. A feature is the number of returned soldiers who have taken up beekeeping after receiving a course of practical instruction at one or other of the training-farms.

WORLD'S DAIRY CONGRESS.

OFFICIAL information has been received that a World's Dairy Congress will be held in the United States early in October, 1923, at a city to be designated later. The congress is being organized under the direction of the World's Dairy Congress Association, acting as a committee of management. While this congress will not be conducted under the patronage of the Government of the United States, great interest is taken in it by the United States Department of Agriculture, which is co-operating with the committee of management, and the Congress of the United States has requested and authorized the President to extend invitations to foreign Governments to participate. The British Government, and the Governments of the British Dominions and colonies, have accordingly been invited to be represented by delegates. In addition to official delegates attendance at the congress by commercial and scientific men interested in the subjects to be considered, including those connected with cattle-breeding establishments and plants manufacturing dairy products and dairy equipment, would be welcomed. It is also pointed out that because of the relation of milk to public health, especially that of children, representatives of child-welfare, public health, and similar organizations will find much value in the congress. It is believed that the proposed congress will be of great value to all participating countries, both from a scientific and commercial standpoint, by the consideration of all the larger problems involved, with a view of making available the best information in existence concerning the importance of milk to the consumer, as well as the most effective and economic method of production, distribution, and official regulation.

CROP STATISTICS FOR SEASON 1921–22.

THE following statistics are compiled from final returns issued by the Government Statistician:—

Crop.	Area.	Yield per Acre.	Total Yield.
Wheat—	Acres.		
For threshing ..	352,918	29·94 bushels ..	10,565,275 bushels.
For chaff, hay, or ensilage..	1,252	1·95 tons ..	2,443 tons.
Oats—			
For threshing	170,655	39·56 bushels ..	6,752,663 bushels.
For chaff, hay, or ensilage..	344,051	1·56 tons ..	538,194 tons.
Barley—			
For threshing	33,078	34·81 bushels ..	1,151,313 bushels.
For chaff, hay, or ensilage..	793	1·85 tons ..	1,469 tons.
Maize—			
For threshing	10,522	46·42 bushels ..	488,452 bushels.
For ensilage	1,039	6·23 tons ..	6,470 tons.
Grasses and clovers—			
For seed—			
Rye-grass	51,356	369·51 lb. ..	19,058,662 lb.
Cocksfoot	14,987	180·91 lb. ..	2,713,640 lb.
Chewings fescue ..	6,231	264·86 lb. ..	1,650,327 lb.
Crested dogstail ..	6,713	214·92 lb. ..	1,442,788 lb.
Red clover and cow-grass	6,910	153·54 lb. ..	1,518,824 lb.
White clover	3,030	119·15 lb. ..	362,812 lb.
Other grasses and clovers	1,927	131·37 lb. ..	373,494 lb.
For hay or ensilage ..	187,363	1·79 tons ..	336,273 tons.
Peas and beans	12,789	26·54 bushels ..	339,398 bushels.
Linseed	5,880	0·48 tons ..	2,830 tons.
Potatoes	19,418	5·76 tons ..	112,090 tons.
Onions	484	8·52 tons ..	4,132 tons.

GRADINGS OF BUTTER AND CHEESE.

The Dairy Division reports the following gradings of butter and cheese for August and September, 1922 :—

Butter.—151,996 cwt. (146,203 cwt. salted, 5,793 cwt. unsalted). Increase compared with corresponding period of 1921, 97·38 per cent.

Cheese.—12,311 cwt. (8,036 cwt. white, 4,275 cwt. coloured). Decrease, 69·10 per cent.

Butterfat-production.—Converting the above quantities of butter and cheese graded into butterfat equivalent, there is shown to be a combined net increase of 65·28 per cent. in butterfat-production for the two months as compared with the corresponding period of the preceding season.

FORTHCOMING AGRICULTURAL SHOWS.

Marlborough A. and P. Association : Blenheim, 24th and 25th October.
Poverty Bay A. and P. Association : Gisborne, 24th and 25th October.
Timaru A. and P. Association : Timaru, 25th and 26th October.
Wairarapa and East Coast P. and A. Association : Carterton, 25th and 26th October.
Ashburton A. and P. Association : Ashburton, 1st and 2nd November.
Manawatu and West Coast A. and P. Association : Palmerston North, 1st, 2nd, and 3rd November.
Canterbury A. and P. Association : Christchurch, 9th and 10th November.
Wallace A. and P. Association : Otautau, 15th November.
Egmont A. and P. Association : Hawera, 15th and 16th November.
Waimate A. and P. Association : Waimate, 16th November.
Banks Peninsula A. and P. Association : Little River, 21st November.
Waikato A. and P. Association : Hamilton, 21st and 22nd November.
North Otago A. and P. Association : Oamaru, 22nd and 23rd November.
Stratford A. and P. Association : Stratford, 22nd and 23rd November.
Otago A. and P. Society : Dunedin, 29th and 30th November.
Auckland Metropolitan A. and P. Association : Auckland, 1st and 2nd December.
Hauraki A. and P. Association : Paeroa, 6th and 7th December.
Southland A. and P. Association : Invercargill, 12th and 13th December.
Wairoa County A. and P. Society : Wairoa, 17th January.
Woodville A. and P. Association : Woodville, 23rd and 24th January.
Helensville A. and P. Association : Helensville, 29th January.
Pahiatua A. and P. Association : Pahiatua, 9th February.
Northern Wairoa A. and P. Association : Aratapu, 9th and 10th February.
Clevedon A. and P. Association : Clevedon, 10th February.
Rodney Agricultural Society : Warkworth, 10th February.
Dannevirke A. and P. Association : Dannevirke, 14th and 15th February.
Wellsford A. and P. Society : Wellsford, 16th February.
Masterton A. and P. Association : Masterton, 20th and 21st February.
Te Awamutu A. and P. Association : Te Awamutu, 21st February.
Omaha and Pakiri A. and H. Association : Leigh, 21st February.
Rangitikei A. and P. Association : Taihape, 22nd February.
Franklin A. and P. Society : Pukekohe, 23rd and 24th February.
Katikati A. and P. Society : Katikati, 1st March.
Morrinsville A., P., and H. Society : Morrinsville, 14th March.
Methven A. and P. Association : Methven, 15th March.
Temuka and Geraldine A. and P. Association : Temuka, 22nd March.
Matamata A. and P. Association : Matamata, 22nd March.

(Agricultural and Pastoral Association secretaries are invited to supply dates and location of their shows.)

Importation of Fruit or Plants.—The following diseases have been added to the Fifteenth Schedule of the regulations under the Orchard and Garden Diseases Act dealing with the importation of fruit or plants into New Zealand : Leaf-roller caterpillar, sweet-potato weevil, downy mildew of grape, and Indian-meal moth. Fruit or plants found infected with any of the diseases listed in this schedule is subject to prompt reshipment or destruction.